The Builder.

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Architects and the Geological Survey.

THE appearance of a two-volume "Memoir of the Geological Survey"* containing much information as to the economics of the region to which it relates, affords a convenient opportunity for reviewing not only the book in question but the general work of the Survey in so far as it affects architects, especially in regard to building stones.

We may state that the Jurassic rocks of Yorkshire are confined to the north-east portion of the county, and according to the memoir before us many valuable building stones are found therein, along several horizons. Passing over the quarries in the neighbourhood of North Grimston, of little value, we may notice the stone at Hildenley, of Coral Rag age, which is said to be the best for interior ornamental work, in the district. It consists of a fine-grained limestone, well adapted for carving, except that small pieces of silicified shell occasionally occur in the stone, which interferes with its free working. This material was employed for the interior of Kirkham Abbey, where it has stood remarkably well. The chapel at Castle Howard was also built of this stone. The formation known as the Lower Calcareous Grit is employed as a building stone along the whole range of its outcrop, from the coast at Scarborough to the Hambleton Hills and throughout a great part of the Howardian Hills. It is, however, usually too soft to be of much value, and is certainly inferior to many other beds in the district, according to the observations of Mr. Fox Strangways. The stone found along the southern outcrop is, in general, of better quality and consequently all the more noted quarries are situated in that part. Amongst them are—Park quarry, at Castle Howard; Brow's quarry, at Malton; and Birdsall quarry, all of which have produced considerable quantities of good material. The Kellaways rock has supplied excellent freestone, but the principal quarries at Hackness and Levisham have not been much worked of late years. The sandstones of the Lower Oolite formation in that part of Yorkshire are largely employed for building purposes. As a rule they are coarse in texture, massive, and suitable for structures where great strength is required, and also for general outside work. The principal quarries in this stone are at Cloughton, Old Fold, at the head of Riccal Dale, and Hayburn Wyke, where it is finer in grain. The rock known as the "Millepore bed" occurs along the coast south of Scarborough, and has been employed in the construction of the pier to the harbour of that town. It is a very hard siliceous rock, breaking up into rough, irregular blocks, well suited to the formation of breakwaters and other similar structures. The massive sandstones of the Lower Estuarine series have been worked at numerous places, but the most important quarries are in the vicinity of Aislaby. Examples of the use of this stone may be seen in Whitby Abbey, Covent Garden Market, the foundations of Waterloo Bridge and London Bridge, and the piers of Whitby, Ramsgate, and Margate. In Rosedale, flagstone of exceptional quality is obtained from the same horizon.

The chief road-metal found in north-east Yorkshire is the "whinstone," an igneous rock obtained from the great basaltic dyke traversing the Jurassic rocks from near Stainton in Cleveland, to Fylingdales Moor. The thickness of this dyke varies considerably, even in the same locality; thus at the top of Cliff Ridge, near Ayton, it is only 20 ft. in width, whereas, at the bottom, 80 ft. have been proved, and its occurrence is somewhat irregular. It is quarried at various points along its outcrop, especially at Lease Rigg, Sleights Moor, Sneaton High Moor, and Fylingdales Moor. These works are connected by a tramway, and with the railway station at Goathland.

Lithologically, the whinstone road-metal is a bluish grey or nearly black, finely crystalline rock, rather compact, with conchoidal fracture. Although generally known as basalt, Mr. Teall has shown that it should be more correctly termed an augite-andesite, and he has given* the following chemical analyses of the material from Great Ayton:—

Chemical Analyses of Whinstone.

	I.	II.
Silica	57·57	59·25
Alumina	14·25	16·75
Ferric oxide	6·04	4·00
Ferrous oxide	3·95	4·82
Manganese oxide	·27	—
Lime	6·87	6·88
Magnesia	4·24	3·81
Potash	1·08	1·92
Soda	2·98	2·56
Sulphur	·19	—
Carbonic acid	·30	trace.
Phosphoric acid	·15	—
Water	1·25	—
	99·14	99·99

Specific gravity 2·77

It is stated that 43,601 tons of whinstone, including 70 tons of "gannister," were worked in 1886, valued at 4,448*l.*

Many of the harder Jurassic rocks are also used locally as road metal, though they are inferior in quality to the whinstone. Special mention may, however, be made of the stone from Spindle Thorn, on Spaunton Moor, where it is more than usually calcareous, dark in colour, and finely crystalline in texture. The well-known Brandsby roadstone quarries in the same series have now been closed. Sandstone, locally called "white flint," found in the upper part of the Moor Grit is extensively used over the district north of the Esk. A siliceous material, known as "Dogger," is sometimes employed as road-metal, especially in the neighbourhood of Scarborough.

The principal sources of cement in north-east Yorkshire are from the "cement stone" of north Grimston, and from the nodules in the upper part of the Lias. The former is a close-grained argillaceous limestone, occurring in the district south of Malton, between the villages of Langton, north Grimston and

* Mem. Geol. Surv.—"The Jurassic Rocks of Britain," Vols. I. and II., Yorkshire. By C. Fox Strangways.

* Teall, *Quarterly Journal of the Geological Society*, vol. xl. (1884), p. 224.

Birdsall, and elsewhere. The lime is known as "Blue Lias lime," or "Lias Hydraulic lime," and has considerable analogy with that from Lyme Regis. This cement, which was first worked in 1856, has been employed in several important structures at Scarborough and vicinity. The nodules of the Upper Lias referred to, when calcined and ground, form a Roman cement. They have been worked at Sandsend, Loft House, Peak and Grosmont, According to the *British Association Report* for 1863, p. 713, "about 20 cwt. of this mineral is found in every 60 tons of shale, and the greater proportion is sent to Hull, where it is manufactured into a cement, sold under the name of Mulgrave cement." It is noteworthy that the first steam-engine introduced into Cleveland, was used for grinding these calcined nodules.

The manufacture of lime is carried on at many places in the district under review, the principal rock used being the Upper Limestone at Seamer, Pickering, Malton and North Grimston.

The occurrence of ironstone in the district, and questions dealing with water-supply are treated of at some considerable length in the memoir before us, as well as matters of less economic importance.

Speaking generally, we have to congratulate the Director-General of the Geological Survey on the publication of so much that is of use—especially to architects. The memoirs of the Survey, as a whole, are not noted for dealing at any great length with questions relating to building stones and the like; in fact, if we exclude those on the "Geology of Cornwall, Devon, &c." (a very old work), the "Geology of the Weald," the "Geology of Rutland," and one or two others, it may be said that next to nothing has hitherto appeared in a connected manner on the subject, in spite of the long career of the Survey. Even where information concerning building stones is vouchsafed, we not infrequently find that it is second-hand, and not of that calibre which might reasonably be expected at the hands of professed geological surveyors. It is true that, in the remarks explanatory of the maps, sundry details are given of the thickness of beds in certain quarries, and if the reader takes sufficient pains he might, by wading through the ponderous reports, be enabled to get together a list of principal quarries in the several districts treated of, but the amount of practical information derived even from this tedious process is not very encouraging. No systematic experiments on stone are carried out by the Survey—not even inexpensive ones; their weathering qualities (a subject eminently suitable for investigation in the field) are only alluded to spasmodically, and often in such a general manner as to render the remarks next to useless. Thus the building stones of such and such a "district," or along this or that "geological horizon," are alluded to—as if the stone could be spoken of in that fashion. What we should like to see is a complete account of each quarry (worthy the name) in the district comprised in the memoir, giving full particulars as to each workable bed of stone, together with its chemical and physical properties, and especially as to its mode of weathering; the Government Geological Surveyor should have ample opportunity of furnishing information on these lines. It is of no use to quote the analysis, crushing strength, &c., of a stone unless the actual bed in the quarry from which it was obtained is specified. And here we may remark that it is ridiculous to keep on citing chemical analyses, or other properties made and ascertained fifty years ago, of and on certain stones which have ever since been vigorously worked. The results may or may not appertain to the material as at present exploited—at all events, it is time to make fresh observations, even if only to confirm the old experiments.

There is another point also to which attention may profitably be directed. For some years we have from time to time published articles in the *Builder* strongly advocating the use of the microscope in investigating the qualities of building stone. When we first touched on the subject, but little notice was taken of it; and certain petrologists who had, apparently, never examined building stones in this manner in their lives, sneered at the possibility of getting much practical result in that way. Since then, however, we have observed the gradual development of microscopic methods of examination of building stones, especially in America, where a text-book has been written taking up the matter with great warmth. American technical journals, also, have done much to encourage this method of investigation. We note that of late the subject has received some consideration in England, and it is now on a fair way to become the most important adjunct in dealing with questions affecting the durability of stone. We do not intend, on the present occasion, to again dwell on the advantages of the microscope in this branch of study, but we certainly think that after what has appeared on the subject, the recent memoirs of the geological survey might have contained something about the minute structure of building stones. More than that we will not say.

Now, in speaking thus, we must disclaim all intention of depreciating the value of the works issuing from the Survey Office, from some other points of view. More accurate stratigraphical descriptions of the formations met with in mapping areas it would be impossible to conceive—the works bristle with facts on every page. But these facts, however useful they may be to the geologist from the purely philosophical standpoint, are not of much value to the architect or engineer. We do not wish now to criticise the maps accompanying the memoirs, more than to say that we have seen much more useful maps in a practical sense in Russia, in Germany, and in Belgium.

It may be objected that we are expecting too much from the Survey; that the annual grant at its disposal is not sufficient to enable it to carry out all these suggestions; or, it may be urged that the primary function of the Geological Survey is to produce accurate geological maps and descriptions of the same, all other considerations being subordinate. We do not know if these be the opinions held by the Survey, but we feel sure that the public entertains entirely different views. True, good geological maps, both "solid" and "drift," are a necessity, but the public regards the survey in the light of officers paid by the State, whose function it is to publish also as much useful and practical geological information of economic value as can be had for the money. The traditions of the Survey might lead its officers to imagine that their primary object is to lay down geological boundary lines, and to write elaborate and erudite theses to be comprehended only by other geologists; and they may also think of questions of economic importance as beneath their notice, or, at best, only to be referred to casually; but we may assure them that the sooner such ideas are exploded, the better. The teaching of the science from the philosophical standpoint might well be left to museums of natural history, universities, and colleges. The public wants to see something of commercial value in exchange for the disbursements from the national purse, and the information should be made as public as possible—we say this advisedly.

We admit that the amount of the annual grant is absurdly inadequate for the purposes of carrying out anything like a model survey—such, for instance, as the construction and *publication* of detailed agronomic maps, or of special geological maps for engineers, or for the medical faculty, or of making a large number of detailed experiments of any kind. But we think that the grant might be made to go much further from an economic point of view than it does at present. By way of illustration, let us for a moment consider the memoirs of the class represented by that on the Jurassic rocks of North-east Yorkshire now under review. We find that this is one of a series of monographs on special formations, and that its predecessor was devoted to the "Pliocene Rocks of Britain." Both give excellent stratigraphical details respecting the formations to which they refer, and from that circumstance they will undoubtedly become classical memoirs. Their authors are unquestionably well suited for the task imposed upon them, and they have displayed a depth of learning of no mean order—as stratigraphists. But when we analyse list after list of fossils from the Pliocene beds, and turn to the second volume on the Yorkshire Jurassics which is devoted almost exclusively to lists of fossils and their geological range, we ask ourselves, first, whether other than specialists in each group are now capable of correctly naming all these fossils, and, secondly, assuming them to be rightly determined, is the publication of such lists of prime importance? Or, to put it in another way, could not that portion of the Survey funds devoted to drawing up lists of fossils, &c., be expended in a more judicious manner? Instead of commencing a new series of monographs on "formations," why not spend the time and money in issuing monographs on subjects of greater economic value? The Survey would then become much more popular than it now is, and if we mistake not would have a much larger annual grant voted for its purposes.

But these criticisms are by the way; we make them, not as strictures, but as suggestions only. The Geological Survey is a very useful institution of which we have the most profound admiration, and far be it from our purpose to add to that disgraceful and unmerited attack made upon it, apparently from personal motives, in the columns of a daily contemporary not long since. Our primary object is to lay some of the claims of architects before the Director General for his consideration, in the hope that he will see his way to cause more attention to be given in future to the practical aspects of geology in so far as they relate to architecture.

THE ARCHITECTURAL DISFIGUREMENT OF UNIVERSITY COLLEGE.

THE intention in regard to the new buildings at University College turns out to be in one sense worse than we expected. We were under the impression that it was the intention to keep the centre portion of the buildings to the street to one story, with the object of avoiding the crowding up of the space and shutting out circulation of air from the quadrangle; and however mean the building would have looked, there would have been at least practical sense in this. It now appears that the whole side towards Gower-street is eventually to be built up the same height as the side wings, leaving only a narrow opening in the centre. By this operation the only fine piece of architectural effect in the neighbourhood is to be removed and the intention of Wilkins's design entirely altered. As if to put themselves in the worst position possible, the authorities—whether with or without the advice of their architect we know not—have not scrupled to assert that they are carrying out Wilkins's design. Sir Douglas Galton, following the tactics which have been long pursued by Lord Grimthorpe when subjected to any criticism in this journal, has made a demonstration on the subject in a daily paper, appealing thereby to the general public, who know and care nothing about architecture or about the questions under dispute, and asserting that he and his colleagues are completing the building according to Wilkins's intentions; in doing which he has left himself in the dilemma either that he has purposely misled the readers of the *Times* as to the facts, or that he has been making positive assertions on a matter about which he knows nothing; which is nearly as bad.

The small plan and drawing preserved among the portfolio of Wilkins's designs in the library of the Institute of Architects, and

described in the title as the "Accepted Design" for University College, shows clearly enough what Wilkins's intentions were. The side wings were to be continued up to the street, and connected by a low, narrow building marked "ambulatory" on the plan, with a gateway pavilion in the centre, and a colonnade towards the quadrangle. Whether there was to be a solid wall towards the street is not quite clear from the plan; the walls of the main building are shown by thick black single lines, the portion towards the street by a double thin line. But in any case it would only have been a low screen wall, as the first floor plan shows the space absolutely open between the ends of the wings, forming a quadrangle enclosed on three sides only. Even the treatment of the end of the side wings, as now finished, is obviously not what Wilkins intended. His plan shows the ends of the wings not flat, but with a break and a wide projection in the centre, and plan and elevation show that he intended to make a projecting pediment over the central portion, carried by four *detached* columns, thus giving force and effect to the street elevation of the wings, and balancing the treatment of the central portico. The present treatment, with a pediment over the whole width of the wing and four widely spaced pilasters, is very tame and flat in comparison, and entirely different from what Wilkins intended.

In contrast with this treatment of the low screen and central gateway, we are now to have two return wings three stories high, with a small gap left in the centre. In regard to this again there has been blundering or worse in the statements made in the Press on behalf of the College authorities. The reporters of the daily papers were told on Monday that the *Builder* was all wrong, that the new buildings were in accordance with Wilkins's intention, and that there would be an opening 100 ft. wide in the centre between the new return wings. Anyone with an eye in his head could see at a glance that there could be no opening of such width left; but to make this more certain we stepped the distance in yards, which anyone accustomed to estimate distances in that way can do with a very near approach to accuracy; and the result is that if a building corresponding in length to the new one were projected from the north side, there would be rather less than 80 ft. left between the ends of the new buildings. But the new wing is not yet carried out to its contemplated length, as the engraved elevation which has been handed about shows; it has to come about 20 ft. further to complete the design, leaving an opening of about 40 ft. wide in the centre. The only way in which the 100-ft. opening could be obtained would be by making the north return wing shorter than the south, thereby destroying the symmetry of the front, and making the exterior opening out of centre with the interior portico; and that would be such an architectural barbarity as we should think not even the authorities of University College would contemplate. This story about the 100-ft. opening in the centre has however been told to the representatives of the daily press, and dutifully repeated by them, and we should like to know how it arose and who is responsible for it.

We should be the last to wish to put architectural effect before practical requirements, though we must say that the destruction of the architectural effect of one of the best buildings of its class in London is not in any case a light matter, and that the erection of a lofty building to the street, where there was formerly an open space, and the practical closing up of the quadrangle, are operations to be avoided on sanitary as well as architectural grounds. If however the University College authorities had frankly said, "We do not care about the architectural effect of the building, but we must have the additional rooms for our educational work," that would have been a comprehensible position. But to assert that they are carrying out Wilkins's design when they are doing nothing of the kind, and to prime the representatives of the daily press with unjustifiable statements in order to put themselves right with any of the public who happen to care about the architectural question, and to misrepresent an architectural journal which has criticised their doings, is a kind of proceeding which is neither comprehensible nor creditable.

NOTES.

FROM what we read in the daily papers there seems to be some possibility that the much vaunted Chicago exhibition will not prove such a success as has been expected. The immense and varied buildings which have been erected there, and the decorations, though not all so superior, we imagine, as they are vaunted to be by American critics, are nevertheless solid facts, energy and talent expended with something to show for them; but suspicion and mismanagement seem to be already rife, and seventeen countries have withdrawn from competition for awards owing to the absolute want of any satisfactory information as to the constitution of the jury who are to make the awards: and considering the national tendency of America to brag and to boast herself the best in everything, which we fear is not yet by any means eradicated, we should think that foreign exhibitors in an American exhibition would be wise to insist on the most rigid balance of nationalities in the composition of the jury, if they wish the awarding of medals to be anything more than a mere farce. It appears moreover, that the system of extortion in regard to the necessaries of life has already shown itself in even a more rampant form than was expected. The crowded quarter of temporary and slightly built hotels, too, must evidently be a danger in case of any accidental outbreak of fire; and one begins to think that it is better to read interesting accounts of the Chicago exhibition in the illustrated magazines than to visit it. Things may work out better presently; but the fact cannot be disguised that the Americans are much better hands at trumpet-blowing and advertising than at organisation; and we have still here the recollection of the American exhibition at Earl's Court, which was exploited in advance as one which was to eclipse all previous exhibitions; for which a special journal was started; into which every railway in England was to be connected; and which ended in an absolute fiasco. It was a disappointment at the moment, but it gave us a useful lesson in the American way of doing things.

THE Railway Rates question enters upon another stage this week, the Select Committee appointed by Mr. Mundella having now commenced their labours. The Committee is a very representative one, comprising statesmen of great experience in railway legislation, and business men possessing practical knowledge of the working of railway traffic and the incidence of the charges thereon. The terms of reference include not only an inquiry into the manner in which the railway companies have exercised the powers conferred upon them, but also an instruction to report upon the best means to be adopted for settling differences arising with respect to the rates and conditions of charge. The trading interest will be looked after by the Mansion House Association,—who decided upon a course of procedure at a special meeting last Friday—and it may be taken for granted that the companies will not be behindhand with evidence relating to the reductions they have been making. Whatever may be proved from a railway manager's point of view, nothing will entirely justify their arbitrary action of last January, to which, of course, must be attributed the clause directing the Committee to consider the desirability of adopting fresh means of settling future disputes. It will be easy enough to show that the conditions obtaining at the present moment approximate pretty closely to those of last year—indeed, we should not be at all surprised if it were demonstrated that the numerous concessions recently made have effected a net reduction on the old figures. But it will be a difficult matter for the companies to convince the Committee that, but for the unprecedented outcry raised throughout the country, they would not be enforcing many charges now, which, when the maximum rates were fixed, it was clearly understood were to be imposed only in cases of extreme necessity. For any prejudice that exists at the commencement of the inquiry, they have certainly only themselves to thank.

A TRANSLATION of a pamphlet on "The Cholera Germ,"* by Dr. Jaeger, which has been sent to us, is mainly occupied with medical considerations, but includes also some remarks on the conditions of dwellings in places where cholera has prevailed, which are of interest. Some extracts from the report of the Hamburg Sanitary Commission on the cholera epidemic there give a classified schedule of the nature and situation of the dwellings in which the epidemic was most violent. Among the worst of these are (naturally) cellar dwellings. Next come "large houses in flats occupied by several families. In one such house, out of eighteen cases of cholera fifteen were in the middle rooms, which are almost without any light or fresh air, the closets being pitch-dark and quite unventilated." These must of course have been very badly-planned examples of houses in flats, but in the present increasing tendency to build houses of this type in London it is a point to be considered, whether the chance of infection is not much greater in houses where several families live between the same walls and roof than in separate houses. In regard to the position of the closets in the interior of the house, with no direct ventilation, it is probably little known how many of the older houses in some parts of London are no better in this respect. There are many on the Bedford estate, houses in good streets and squares and letting at good rents, where the water-closets are in the centre of the house, opening off the staircase, and with no window to the outer air; in some cases, we believe, no ventilation at all except into the house itself. In case of a cholera epidemic, we should expect to find that those houses were the most liable to the disease; and it is a question whether the wealthy owners of some of these large London estates ought not to be compelled, in the interests of public health, to alter all houses which have been so planned. Another class of houses mentioned in the Hamburg Report, are houses with the back rooms looking on a small and confined yard; "the odours of a large cellar in which potatoes were stored, or stables on the ground floor, of a dung-pit in the yard, of the closets, were unable to get away, and permeated these rooms." This is a piece of statistics which has a direct bearing on a subject touched upon in another "Note" on this page. We may observe that Dr. Jaeger considers English cities to be far superior in cleanliness and sanitary condition to those of Germany, and we have no doubt he is right; but we must not on that account shut our eyes to the fact that there is much to be done in our towns yet, before they can be considered to be as healthy as modern cities can and should be made.

WE have received a pamphlet consisting of various letters published lately in the Newcastle *Daily Chronicle* on the subject of back yards and back streets. The object of the writer, "A. V.", who started the correspondence is to suggest, as we under-

* Waterlow & Sons.

stand (for the letters are not very clearly expressed), that gardens should be substituted for back yards in the inferior class of houses, by doing away with the division walls and laying out the space in the rear as a garden common to the row of houses, with only a wall at each end. Another correspondent, Mr. F. L. Newcombe, suggests "one main road, no back street, the entrance door on the side facing the road, and the best rooms facing a garden at the back," and also suggests, in the arrangement of sites for workmen's dwellings, "dispensing with the front streets, using the space between the fronts of the houses for gardens, with a footpath four or five feet wide up the centre, the cart access being by the back streets as at present." One or two plans appended to the pamphlet* would have enabled us to understand better the arrangement which is deprecated and the improvements which are suggested, for more than one of the correspondents speaks as if the "craze for back yards and back streets" was a special feature of northern towns, and refers to the example of London and other cities in the south; whereas every one familiar with the views from London railway viaducts knows that the back yard system, with its divisions of back walls in parallel rows, is as common in London as anywhere, and a wretched spectacle it makes from the bird's-eye point of view. There can be no doubt that this shutting up of the spaces behind small houses with high brick walls is a very insanitary system, and that a great improvement in the conditions of life in the poorer quarters of cities would be achieved by some such arrangement as that suggested by "A. V." and the other correspondents whose letters are included in the pamphlet in question, and the Newcastle public should be indebted to "A. V." for drawing attention to the subject. The suggestion made by one correspondent, to build the smaller class of houses in quadrangles with a garden in the centre, is not one to be recommended; it checks the free circulation of air to the houses: they are much better in parallel rows open from end to end.

THE last report of excavations at Athens (issued in the 4th Heft of the Athenian *Mitheilungen* for 1892, just published), contains many items of interest. First come the discovery of a portion of the ancient city wall to the east of the Acharnian gate at the corner of the Sophocles and Aristides streets. The material of the wall consists of great blocks of breccia stone, and from this it may safely be concluded that we have not to do with the original wall of Themistokles, which was built of limestone on clay tiles, but with a restoration not earlier than the fourth century B.C. The newly-discovered wall has been carefully photographed, and prints can be obtained from the German Institute at Athens. The wall was of very remarkable strength, the foundations measuring a little over 5 mètres, which would allow for the wall above ground being about 4·90 mètres. At about 7 mètres distance a second and thinner wall has been found, the purport of which is at present not made out. To the south of the Acropolis a whole row of drums of marble columns have been found near the Katastamatis silk manufactory. They were built in to strengthen the old city wall, and probably belonged to the Stoa of Eumenes. They must have been utilised for their new purpose in quite late Roman days, or even in the Middle Ages. We are promised very shortly a discussion of the whole question of the ancient topography of the city, especially of the much-contested passage in Thucydides, ii., 15, as to the lie of the primitive city.

AT Eleusis Mr. Philios has found another piece of the city wall, and sufficient remains have now come to light to make the whole line intelligible. He has also found an ancient well, which he thinks is the famous Well of the Fair Dance, Καλίχορον φρέαρ (Paus. i. 38-6), where the Eleusinian women first danced and sang to Demeter. From Delphi comes the news of the first substantial discovery as yet made. The excavators have laid bare the "Treasure House" of the Athenians, a building in the form of a small Doric temple, decorated with sculptured metopes. Five fragments of these have been discovered, and are archaic in style. Inscriptions to the amount of 150 fragments have also been found, and they put the attribution of the temple beyond a doubt. Pausanias, it will be remembered, mentions (x., 11) the Athenians' Treasure House, with those of other people's, just before he passes to the Stoa of the Athenians which still remains in part above-ground. He says that spoils from the victory of Marathon were dedicated there.

* Published, under the title "Beautiful Homes," by Mawson, Swan & Morgan, Newcastle-on-Tyne.

LEGISLATION has been busy of late with London churches. In pursuance of an Order in Council, made in March last, notice is given by the rector and churchwardens of their application to the Consistory Court for a faculty to remove the remains of persons buried beneath the floor and in the vaults of St. Martin Ludgate. The church, which is believed to stand on the site of a Roman cemetery, was rebuilt by Wren at a cost of 5,379*l*. The fabric of St. Martin's is one of the four churches that are preserved from demolition under the Union of Benefices Act, 1860, by clause fourteen of that statute. The Ecclesiastical Commissioners' scheme for the union of the parishes of All Hallows-the-Great and All Hallows-the-Less, with St. Michael Paternoster Royal, and St. Martin Vintry, has been finally approved, and involves the destruction of the church of All Hallows-the-Great, in Upper Thames-street, which was closed in 1890 owing, it was said, to its insanitary condition, by order of the Commissioners of Sewers. To that church, designed by Wren, the Hanse merchants, to whom Henry III. had granted a settlement in the neighbouring Steel-yard, gave the carved oak screen which is illustrated in the late George Godwin's "Churches of London." Godwin says:

> "It was manufactured at Hamburgh, and presented to the church by the Hanse merchants, in memory of the former connexion which existed between them and this country, so that it is probably the work of a foreign artist. No mention of the date of the presentation appears in the parish books, but common report ascribes it to the reign of Queen Anne."

In All Hallows was buried Theodore Jacobsen, architect of the Haslar Royal Hospital, Gosport, and governor of the Foundling Hospital, London, for which he made a plan and elevation. The churches of St. Martin Vintry, and All Hallows-the-Less (its site latterly occupied by Calvert's, since the New City of London, Brewery), were not rebuilt after the Great Fire: so St. Michael's will serve for the four united benefices. The union of Holy Trinity, Minories, with St. Botolph, Aldgate, is now ratified; we understand that the former church will not be pulled down, as was originally intended, but will be converted to the purposes of a local mission-room. Holy Trinity—rebuilt of brick, in 1706—represents an abbey of Poor Sisters of St. Clare, or Nuns Minoresses, established by Blanche, Queen of Navarre. We printed an account of the church, and the decapitated head preserved there, vulgarly known as the "Duke of Suffolk's," on Jan. 9, 1886.

THE "Old Paris" erection at Earl's Court, including the representation of the interior of the Bastille on its full scale, is one thing, and perhaps the only thing, in connexion with the so-called Forestry Exhibition, which is really worth going to see. The street of houses does not convey any impression of realism, partly because the old Paris pavement and gutters are not represented, and because the buildings which line the street are mostly not on full scale, and the street appears much too wide in relation to them. The "Église Ste. Marie" is a mere model, and we hope the innocent spectator is not beguiled into thinking that it represents the true scale of a Paris edifice of that type and date. In this respect the "Old London" exhibition of former days was much better, as the majority of the houses, buildings of a smaller and more fragile type, were shown to pretty near the right scale. We admit that it could hardly be expected that a whole street such as this should be built up full size for a temporary exhibition, when it is a mere piece of accessory to the principal object, the Bastille; we only wish to point out that it is not to be taken as realistic. But the Bastille arises, full size, in all its gloomy and portentous grandeur, and with a completely successful imitation of the effect of time-stained masonry; it is really well done, and after seeing it one feels better able to realise in the imagination the historic scenes of which it was the centre.

WE learn that extensive deposits of the so-called Mexican onyx marble have recently been discovered to the south-east of San Diego, in the peninsular of Lower California. The prevailing tints are rose, light green, and white, variously veined. The stone occurs in good-sized blocks and takes a high polish. It is, as usual, not stalagmitic in origin, but like the Mexican deposits of the same class of material, it is a travertine, or deposit from springs. Specimens are to be cut and polished for exhibition at the World's Fair. Quite recently also some onyx quarries have been opened up near Prescott, Arizona, at a place called Cave Creek. The main onyx ledge here lies on the western slope of a low basalt-capped hill, and the maximum thickness workable is about 10 ft. The tints are very striking, being green and yellow, with veins of ochreous brown and red. The occurrence of chalcedonic quartz in the stone, however, is a considerable drawback, though it is believed that this will disappear as the rock is worked into. A large quantity of ornamental stone is annually imported by the United States (about 600,000 dollars' worth), but much attention has of late been given to the development of its own marble resources. The discovery of these onyx deposits, together with those found about two years since in the Ozark Mountains, Missouri, which are now being exploited, seriously menace the employment in America of the well-known Mexican onyx.

THE Cathedral Church of St. Giles, Edinburgh, has just been enriched by a noteworthy mural monument to the late Lord President Inglis, who died nearly two years ago at the ripe age of eighty-one. The monument is from the designs of Dr. R. Rowand Anderson, and is placed on the eastern wall of the beautiful Preston Aisle. From the south side of the same aisle projects the chapel of St. John the Evangelist, built and endowed by Walter Chepman, Scotland's first printer, in 1513 (the year of Flodden), in which the mutilated remains of the great Marquis of Montrose were buried, ten years after his execution, in 1660, and where, since 1888, has stood the very noble monument erected to his memory, also from the designs of Dr. Anderson. The two monuments by the same architect naturally provoke comparison in spite of their difference of scale. Both are of rich materials, marbles and alabaster, profusely sculptured, coloured and gilt; both are Renaissance in style; but the earlier monument is much more distinctly Italian in feeling, while that now erected to Lord Inglis has more Jacobean, and even local, character. It consists of a central panel of marble and alabaster, bearing the inscription and the arms of Glasgow and St. Andrews, flanked

by disengaged black marble columns, standing on a deep plinth course, and carrying a rich entablature surmounted by armorial bearings, sculptured and coloured, with seventeenth-century ornament, florid but good, in some profusion. The monument is corbelled out from the wall on carved brackets, bearing arms of Edinburgh and Aberdeen—Lord Inglis was Chancellor of the University of Edinburgh—as well as the late judge's own crest. The whole is dignified and very rich, and worthy of its designer, though perhaps scarcely so successful as the much more important Montrose monument hard by. The conventional drapery in alabaster of the centre panel is open to criticism as a field for a memorial inscription; and the black marble obelisks surmounting the entablature above the columns are slightly obtrusive and disturbing. The columns themselves would be better if less highly polished, but this is a defect which, in common with the over-newness of gilding and colour, time in a northern climate will only too quickly and effectually cure. The whole monument is, perhaps, somewhat too big for its position between a large flamboyant window (greatly in need of stained glass) and the very delicate Gothic pier of the aisle arcade. It is, however, on the whole very beautiful, most carefully studied, and full of refinement, a welcome addition on the grey walls of the fine old church, whose bareness modern piety is tardily adorning, after the wanton and deplorable "restoration" of 1829, and the more excuseable, if infuriated, zeal for destruction and "purgation" of 1559.

FROM some correspondence in the *Perth Constitutional* it appears that it is proposed to fill the large east window of the East Church, Perth, with a stained-glass in commemoration of the life and work of John Knox. The idea seems a good one, though it is rather amusing to think of Knox being commemorated by a form of decoration which he would probably have been ready to denounce as a Popish and superstitious addition to a church.

FROM an account published in the *Evening Dispatch* (Edinburgh) of May 25, we learn that there is to be a restoration undertaken of the crypt of the parish church of St. Nicholas, Aberdeen, known as St. Mary's Chapel, said to be "the only example of ecclesiastical stone vaulting in Aberdeenshire." The chapel is identified by the Marquis of Huntly as being the "Cocklarachie Isle of St. Mary," founded early in the fifteenth century, and endowed from lands of Cocklarachie, by Elizabeth Gordon, who by her marriage with Alexander Seton (who took her name) became the ancestress of the Earls and Marquises of Huntly and the Dukes of Gordon. The chapel, we gather from a sketch published in the *Evening Dispatch*, is now fitted up with pews and seating, and the architectural features, except the vault, much decayed and knocked about. The following statement is given in the *Dispatch* as to what is now proposed to be done:—

"At a public meeting recently it was resolved to accept the offer of Messrs. A. Marshall Mackenzie, A.R.S.A., G. G. Jenkins, and W. Kelly, to act as an architectural committee, and issue a statement, from which the above facts are gleaned. The chapel consists of a central portion with an apsidal end, and a north and south aisle. Down these aisles there had formerly been stairs from the East Church above, and the two side aisles had been at a higher level than the chapel proper. In the reconstruction the old levels are to be restored, and by doing this the proportions of the building will be much improved and the chapel better seen. The chapel is very rich in carved woodwork of the seventeenth century, which had been originally partly painted, and it is proposed to line the walls with this material up to a height below the spring of the arches. The floor, which is at present of wood, will be relaid with granite pavement in geometrical patterns. The whole of the square-headed windows are to be taken out in the inside and filled with properly-designed tracery and rear drop arches; while the vaulting of the chapel, which had been plastered, is to be decoratively painted."

We fear there will be a good deal of difference of opinion as to the real value of so drastic a "restoration" as this. When in process of time the new work ceases to look new, there may be some difficulty in ascertaining what is genuine old work and what is nineteenth-century restoration. The careful preservation of what now exists would be more to the purpose.

WE have received from Messrs. Raphael Tuck & Sons a series of coloured miniatures of panels of flower and figure groups, intended to be affixed to the panels of doors as decorations, with a few full-size specimens of the panels. They are designed by Mr. W. S. Coleman, Miss Bertha Maguire, and other artists, and are good examples of work of their kind, but not in our opinion sufficiently conventionalised to be classed as true ornament; they are rather chromo-lithographed flower paintings. We cannot say that this method of decorating door-panels commends itself to us; but if there is a fashion for having flower paintings on door-panels, and people are content to do it in a cheap form by fixing on chromo-lithograph reproductions, they will find these useful in satisfying their own tastes and those of their friends, and good of their kind, though we hardly think they will find acceptance with those who have an artistic view of what house decoration should be.

AN attempt is to be made at the Special Meeting of the Institute on Monday night to persuade members to upset the procedure of the Council in petitioning against the Architects' Registration Bill. The motives of the movement are obvious enough, and those members who wish the action of the Council to be supported will do well to attend the meeiing.

ARCHITECTURE AT THE ROYAL ACADEMY.—V.

1584: "New Banking Premises Chester"; Messrs. T. M Lockwood & Sons. This is evidently an attempt to produce a building which looks solid enough for a bank but is nevertheless in keeping with the picturesque style of the old (and some of the new) Chester architecture. It is a modern Elizabethan building in solid masonry, with large semicircular headed windows to the Bank-room, rising from the surbase moulding; a certain castellated effect is conveyed by the two circular turrets corbelled out at the canted angle of the building, the open cupolas of which, carried on small columns, have a pretty effect. There is no plan, but perhaps one can hardly expect that the plan of a bank should be made public property.

1587: "Oxford Municipal Buildings; one of the five premiated designs"; Messrs. Cheston & Perkins. The original "sketch competition" elevation apparently; a good and suitable Gothic one with a low tower with octagon finish, square-headed mullioned windows below and larger segmental headed late tracery windows above, with a sculptured frieze between. We think this is one of those which we noted, in reviewing the competition, looked so much more satisfactory on the small than on the large scale; if so, the authors have probably been wise in sending their small sketch. They should have added a plan. Another of the sketch designs, that by Mr. Pennington (No. 1,591) is hung, as a "commended design"; it is unobjectionable in taste but not much more. The larger drawings of Oxford Municipal Buildings designs by Mr. Hare and Mr. Rüntz (Nos. 1,588, 1589, 1590) we have already spoken of.

1,593: "New Music Room, Marlborough College"; Mr. C. E. Ponting. Is this an inspiration from the new American style? There is rather a wigwam look about it—a brick building with an over-sailing tiled gable, apparently supported in the centre by a bay window; octagon turrets at each side with the plainest of builder's house windows below, and immense extinguisher-looking slated roofs above, crowned with the now fashionable cupola or gazabo on colonnettes. A columned porch runs across the lower story, stopped by the turrets. A small plan shows a centre music room with corridors and practising rooms round. The whole is picturesque but somewhat eccentric.

1,594: "Guildhall, Cambridge"; Mr. W. M. Fawcett. This is what we should call an exceedingly "correct" building, with its rusticated basement with round-arched windows and its pilaster order above, but surely some little touch of originality is needed to give interest; it looks like a kind of pattern building. The drawing is not adapted to add any interest to the design, being somewhat cold and formal. No plan.

1,595: "'The Bury,' King's Walden, Herts"; Messrs. Beeston and Burmester. A good drawing of a good country-house, to which a small but carefully-drawn plan, with a north and south point, is attached. The plan is a good one in the main, but the corridor from the entrance door to the hall is rather a long step, and the w.c. in the women's yard seems disagreeably near the bakery. The house is in a quiet quasi-Elizabethan style, shown in a good pen-drawing. An octagonal ice-house inserted in the line of boundary wall of the yards makes an incident in the design.

1,596: Stables to the last-named house, by the same architects. The small plans appended hardly show what all the rooms are, though one can distinguish stables and loose boxes. The buildings are not in any "style," but are unobtrusively picturesque, with wide spreading eaves and high pitched roofs. By the same architects again are

Nos. 1,597 and 1,598, "Hurstborne, Hants," entrance front and view from south-east. The latter is a good pen-sketch of a house of Elizabethan character, which derives some special effect from the two large ocatogonal turrets which flank the further wing, otherwise it is like many other houses in this style. The drawing of the entrance front is a rather hard and mechanical one, showing a carriage porch and the staircase block in the rear, both richly treated with the accepted kind of rather corrupt ornamental features proper to the style, but not showing any invention.

1599: "St. Matthew's Church, Morningside, Hants"; Mr. Hippolyte J. Blanc. A rather dull and lifeless-looking pen-drawing of an admirably grouped bit of building, a cross church of early Gothic type, seen from the north-east, with an octagon vestry in the angle of chancel and transept, a flêche on the roof ridge near the east gable of the nave, and a tower with a light and slender spire, standing rather clear of the general group at the north-west angle. The whole makes an admirable bit of architectural composition, and merited a better and more effective drawing.

1,600: "Donhead St. Andrew's Church; Proposed Chancel and Aisle"; Mr. C. E. Ponting. A bit of modern work in late Gothic manner tacked on to what seems to be a cemented or rough-cast church of the ancient churchwarden type. The interior shows a heavy cambered and moulded tie-beam with open geometric tracery in the spandrels between that and the rafter. The building is illustrated in pretty and effective little water-colour sketches on toned paper.

1,601: "Proposed Town Hall and Offices, Farnworth"; Messrs. Bradshaw & Gass. The front is effectively treated, but the whole is a little too much like a slice of front, with nothing to call architecture round the corner. In the upper story there is an effective treatment of coupled pilasters rather wide apart, with niches and statues between them, and round-headed mullioned windows with rusticated arches. The finish of the tower is rather awkward in outline. No plan.

1,604: "The Music of Life"; Mr. H. Granville Fell. A decorative study of figures conventionally arranged, with a background of gold across which rise the stems of trees, the foliage of which forms a canopy over the figures. The colour effect is rich and harmonious, the two nude children representing childhood are a very pretty group, and contrast effectively with the crimson robes of "Amor," the next figure in the procession. As a treatment of figures in a decorative manner but with a symbolical meaning, this is a very successful piece of work.

1,605: "Town Hall, Brescia, Italy"; Mr. James C. Watt. A beautifully executed elevation of a fine bit of Renaissance building, with an order plainly treated on the ground story, with arches between, and a very richly decorated order in the upper story. A small scale plan is given. A very good piece of illustrative drawing.

1,606: "House at Surbiton-on-Thames;" Messrs. Kidner & Berry. An unpretending house

in what may be called English Domestic style; there is an amusing little bit of eccentricity in the treatment of the entrance porch, where the arch is returned round at the springing, projecting inwards towards the porch and ending in a small scroll on the top of a pedestal. It looks a little too much as if it were meant to sit on, or would probably be used for that purpose.

1,607: "L'Eglise Protestante Française de Londres," interior; Mr. Aston Webb. A large pen drawing of the interior of this church, of which we illustrated the exterior in the *Builder* for June 27, 1891. It is a very fine solid interior in what may be described as a round-arched Gothic style (not Romanesque), with a great deal of special character. The arches are fully and finely moulded, the walls are treated in bands of differing stones. The nave arcade shows strongly moulded semi-circular arches, the mouldings dying into the piers without imposts, except that the soffit member is stopped by a capital and small coupled shaft. A kind of triforium balustrade, with heavy square balusters alternating at every fourth space with small coupled shafts, runs under the clearstory windows, and is carried out on large corbels round the piers, in a manner recalling a somewhat similar treatment of a balustrade in the nave arcade of St. Etienne du Mont at Paris, only that in that case the balustrade goes round the pier below the main arcade. The ceiling is a segmental timber one with boarding at back of the rafters. The east end shows an apse, with narrow heavily moulded windows above, and the front of the organ below, following the line of the apse and kept nearly flush with the wall line except for the two projecting turrets. This looks very well in an architectural sense, but the organ must be very much out of the building, and rather badly placed for sounding, though by no means so badly as in the usual "organ-chamber." The central portion of the organ front is interrupted by a large panel forming part of the architectural design, into which the orthodox inscription of the Commandments is worked, with a title panel supported by two angels above it. The whole design is most original and effective in treatment; we shall publish a lithograph of it next week, our space this week being entirely occupied by the illustrations of Durham Cathedral.

1,608: "Gamekeeper's Lodge in the Ardennes"; Messrs. Kidner & Berry. A small stone-built house with ball finials at the feet of the gables, and a peculiar form of stone chimney which may be of the district, or may be an imitation of a favourite form of Norfolk chimney.

1,609: "Design for a Large Town House"; Mr. A. Hart. This was illustrated in the *Builder* of January 23, 1892. It is a rich and striking design in modern free Classic style, but rather wants restraint and simplicity. The cornice is very heavy and not good in profile, the upper members being decidedly too large for the lower portion, and we should consider the wide semi-circular windows of the ground floor too much of the character of a business building rather than a private house. The middle portion, with the mullioned windows between columns, and the decorative panels between the first and second floor windows, has a very good effect, but the cornice and some other details are hardly in scale with it. However, it is an ambitious and spirited attempt, with a great deal of merit.

LETTER FROM PARIS.

IT is hardly worth while to bestow any space on the exhibition of the "Union Libérale," an exhibition which is of no value to anyone, and is only another edition of the "Salon des Refusés" of a former year. We have become somewhat weary of exhibitions of eccentricities, and what at one time seemed amusing becomes now only rather irritating.

At the Palais de l'Industrie the jury which was to settle the awards of the year has made its report. After two turns of voting, 194 votes have been recorded in favour of M. Roybet as the recipient of the "Médaille d'Honneur." M. Roybet was born at Uzès in 1840. After having for a long time ceased to exhibit, his reappearance at the Salon has been a complete success. After having received a medal in 1866, he received a decoration in 1892, twenty-six years later, and has now obtained the highest honour the Salon can award. Among his principal works may be mentioned "Un Fou sous Henri III." (Salon of 1866), and in 1868, "Les Joueurs de Trictrac."

In sculpture, the Médaille d'Honneur has been awarded to M. Charpentier, author of the fine monument at Avignon, which was recently published in the *Builder*. He obtained the "Prix du Salon" in 1890 and the Legion of Honour in 1892. He exhibits this year a group in marble, "Les Lutteurs," and a plaster statue, "Les Hirondelles."

In the section of architecture, M. Defrasse, the author of the "Restauration de l'Enceinte Sacrée d'Epidaure," has obtained the Médaille d'Honneur by forty-three votes, against seven given for M. Fourneau, author of the restoration of the royal pagoda at Vât-Cheng, five given to M. Coquart, and two to MM. Godefroy, Bauhain, and Paul Normand. M. Defrasse, a pupil of M. André, obtained a second medal in 1882 and the Prix de Rome in 1886.

In engraving, the Médaille d'Honneur has been awarded to M. Ch. Lamothe, pupil of Henriquel Dupont, who this year has exhibited two fine engravings, "Les Bergers," after Nicholas Poussin, and the "Amateur d'Estampes," after Meissonier.

The minor awards we need only mention in regard to architecture. The First Medal has been given to M. Emile Camut for his restoration of the Baths of Mont Dore; second medals to MM. Godefroy, Bauhain, Nodet, Paul Normand, and Bobin; third medals, MM. Auguste Rives, P. Bernard, Ch. Naudin, H. Petit, P. Heneux, G. Majou, and C. Yperman.

It appears that, in default of bidders, the demolition of the buildings of the old Sorbonne is postponed for some months. This is only a delay, however; and the archæologists, who lament over the destruction of the remains of old Paris, are bitter (not without reason) against both the Government and the Municipality of Paris for the implacable manner in which they are uniting their efforts in a crusade against historic monuments of Paris. Nothing can prevent the ultimate destruction of these old buildings of the Sorbonne, the stern and sombre originality of which accorded so well with their function as the home of the ancient school of learning. It is much to be regretted that M. Nenot did not include in his scheme the preservation of the Cour d'Honneur, as he has preserved the chapel, by incorporating it in the new buildings.

Not far from here there has disappeared recently another vestige of Old Paris. The celebrated hôtel built by the Chancellor Juvénal des Ursins, situated near the Quai de la Cité, has just been destroyed. The work of demolition has brought to light a part of what was formerly the chapel of St. Aignan, a curious specimen of Romanesque architecture built in the twelfth century under Chancellor de Garlande. Some remains of the vaulting, and some curiously-carved capitals belonging to this erection, have been discovered. Several neighbouring houses dating from the middle of the sixteenth century have shared the same fate, giving place to the heavy and commonplace buildings which surround Nôtre Dame. While the administration is thus pitiless in regard to ancient structures, it shows on the other hand an exaggerated care for more modern ones, and is now expending a considerable sum on the restoration of the Fontaine Saint-Michel, one of the most commonplace monuments built under the Second Empire, from the designs of Davioud.

On the Marché aux Fleurs, opposite the façade of the Palais de Justice, there is to be inaugurated in a few days the statue of Théophraste Renaudot, physician to Louis XIV., and said to be the founder of French journalism, and also of the Assistance Publique. The statue is the work of M. Alfred Boucher. On the Place de l'Odéon the statue of Emile Augier is shortly to be erected, the execution of which has been entrusted to M. Auguste Barrias. There is also talk of erecting in the garden of the Luxembourg, not far from the Delacroix monument, a statue to Henri Murger, who preserved in his well-known novels the memory of the old habits and life of the students of the Quartier Latin. As to the monuments to Balzac and Alfred de Musset, commissioned some years ago by their respective subscribing committees, no date has yet been fixed for their erection, and it is believed that the models for them are still far from completion.

Passing from the left to the right bank of the Seine, we may observe first the present state of the decorations of the Hôtel de Ville. In the Salon Lobau M. J. P. Laurens is at work on the set of historic scenes to which his large picture of the "Voute d'Acier" was the prelude, and of which the next in order was "Etienne Marcel Protégeant le Dauphin." The artist is now occupied on a large composition entitled "Louis le Gros Donnant aux Parisiens les Franchises Municipales." On the grand staircase one can now see a small portion of the decoration by MM. Olivier and Merson, who are ornamenting the cupolas of the side galleries with paintings representing the twelve months. Each cupola is subdivided into four compartments decorated with small symbolical figures surrounded by garlands, constituting a collection of forty-eight different compositions, of very good effect in regard to colour, but which would gain by being somewhat simplified and treated in a larger and broader style than is the case with the portion now executed. On the same staircase there will shortly be completed two cupolas, accompanied by pendentives, executed by M. Schommer and Joseph Blanc. The first has chosen for his subject "Les Chansons des Rives de la Seine," the second, "Les Mois du Calendrier Républicain." In a neighbouring gallery M. Henri Martin is at work on a large allegorical ceiling painting, of very fine and harmonious colour effect, and as it is placed high up, the rather woolly effect of the peculiar manner of execution, touch by touch, which he has made his own, will not be so apparent as when his pictures are seen from a nearer point of view. In a few weeks the jury of the Hôtel de Ville decoration will have to decide on the second competition for the decoration of the Salle des Banquets. Of the three artists engaged, M. Georges Bertrand seems to have the most chance of obtaining the execution of the work.

After the exhibition of 1889, the Ministry of War collected, in a gallery on the Esplanade des Invalides, an exhibition of ancient arms, uniforms, and other objects, some from the museums of Paris and the provinces, others lent by other Government departments or by private collectors. After the close of this exhibition, the collectors and artists, with Meissonier at their head, formed a society with the object of reconstituting this collection in a permanent form. M. Edouard Detaille now presides over this society, which is called "La Sabretache," and by its efforts it is hoped that a museum of real interest will be constituted at Paris, and which will find in the Hôtel des Invalides, where there is now plenty of space to spare, an appropiate home, in which also the Musée de Marine may be accommodated.

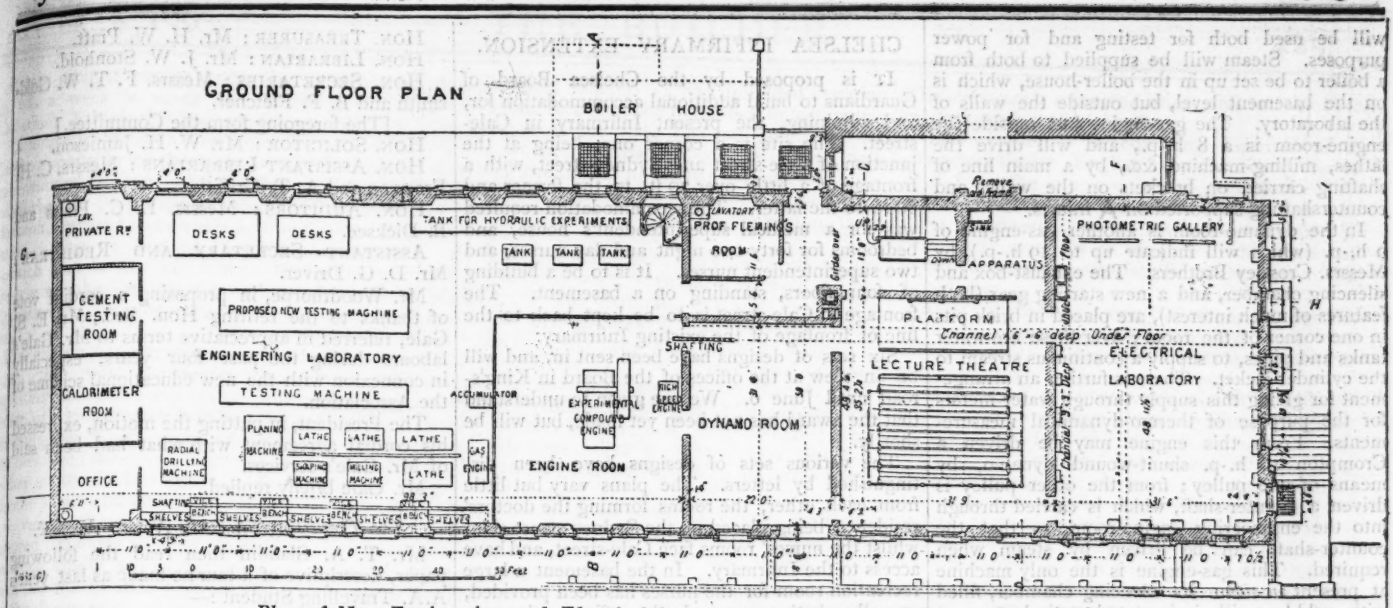
The Spitzer sale continues with the same success as at first. At the moment of writing, the receipts have attained to 6,484,825 francs. We may mention in this connexion the sale of the artistic collection of M. Coquelin ainé, which has produced 581,000 francs, a remarkable sum for the mere collection of an amateur. In a few days will take place also the sale of the works in the atelier of the lamented artist Voillemot. This will include, as well as his own works, a good many pictures by others among the most notable painters of the day.

The Congress of French Architects will meet this year on Monday, June 19, the session lasting till the following Saturday. We shall be able to publish the programme shortly.

It is with great regret that we have to record the death of M. Alfred Darcel, Director of the Cluny Museum, in which capacity he had succeeded M. du Sommerard. M. Darcel was born at Rouen, in 1818. After having carried on his studies in his native town, he came to Paris to pass through the course of the Ecole Centrale. He was occupied at that time with chemistry, but soon quitted science for art, and, after having been attached in 1852, to the "Service des Expositions," he in 1862 received a permanent appointment in the Louvre. His refined taste for archæology and his learned researches in that field, soon brought him into further notice, and in 1871 M. Jules Simon, then Minister of Public Instruction, appointed him director of the national tapestry manufactory of the Gobelins. He occupied this important post until 1885, when he was entrusted with the management of the Cluny Museum.

M. Darcel was the author of a number of works on Art History, especially on tapestries and textiles, and contributed to various reviews, from time to time, some very learned and able articles on theatrical costumes and decoration. His successor at the Cluny Museum has not yet been selected.

MR. BATSFORD'S CHANGE OF ADDRESS.—Mr. B. T. Batsford, the well-known architectural bookseller and publisher, asks us to mention that after June 5 his business (which has for over forty years been conducted at No. 52, High Holborn) will be removed to more convenient premises, No. 94, High Holborn. We comply with pleasure, and wish Mr. Batsford continued prosperity in his new quarters.



Plan of New Engineering and Electrical Laboratories, University College.—Ground Floor.

THE NEW LABORATORIES AT UNIVERSITY COLLEGE.

THE New Engineering and Electrical Laboratories in University College, London, were opened by H.R.H. the Duke of Connaught on Monday afternoon last. Professors Fleming and Beare, who have charge respectively of Electrical Engineering and Mechanical Engineering at the College, met the representatives of the Press at 11 a.m., and courteously conducted them over the buildings, explaining the arrangements which were contemplated, and the circumstances which had rendered this extension necessary, and providing each with an official account thereof. We are compelled largely to rely upon this account in what follows, for the engineering laboratory was filled with two galleries for the accommodation of the visitors to the afternoon ceremony, the platform between them occupying the space opposite the door, where lathes and milling machine are indicated on the plan. We will first of all quote from a description of the buildings written by the architect, Mr. T. Roger Smith, F.R.I.B.A., Professor of Architecture and Construction in University College :—

The main building of University College, London, was erected from the designs of Wilkins, and, with the dome and fine portico, is an excellent example of his skill as a designer. This building has been already enlarged by the erection of a south wing, occupied by University College School, in 1869, 1873, and 1876, and by the erection of a north wing in 1871 and 1881, occupied partly by the Slade School of Fine Art and partly by some of the science departments, both from the designs of Professor Hayter Lewis. So extended, the buildings occupied three sides of a square, open to Gower-street on the fourth side. Considerable enlargement having again become necessary, the Council, not without reluctance, came to the conclusion that it was unavoidable that the fourth side of the quadrangle should be occupied by the new buildings required, and of these a first instalment is about to be opened. There is room towards Gower-street for a southern block measuring 210 ft. by 55 ft., and a northern block of greater length by the same depth, still leaving open between them a central space of ample width to connect the quadrangle with Gower-street, and to afford a view of the central dome and portico.

Of these two possible blocks the southern is the one which has been begun ; at its south end it is carried to the full intended height, and a basement is constructed, affording in all, four stories. The northern part of the block (which is not yet carried quite to its full extent northwards) has no basement, so as to afford solid foundations for the machinery which is to be placed there. This part has only been carried up one story, and is provisionally roofed in at that level. This portion of the building is to be used as the new engineering laboratory, to which a space measuring 50 ft. by 98 ft. 3 in. clear of the walls, is appropriated. It contains an engine-room and an office, a calorimeter-room, cement testing-room, and a private room for the professor, besides the general laboratory, and is spacious, airy, and extremely well lighted.*

The southern part of the ground story (see plan) is appropriated to the electrical department, and contains a dynamo-room, a lecture-theatre, with an apparatus-room adjoining, and electrical laboratory, and a private room for the professor, all compactly and conveniently disposed. The basement-story under this part of the building contains the accumulator-room, the heating apparatus, lavatories, and a large pattern shop and carpenter's shop, and communicates with the boiler-house, which is not under any part of the buildings.

The first floor is occupied by a theatre, with its apparatus-room and photographic dark room, for use by the classes of engineering and of graphics, a class-room, a professor's room, and a museum for engineering specimens.

The whole of the second or topmost floor is a room for engineering and geometrical drawing.

The entrance to these departments will be from the quadrangle, and a staircase in Walker's artificial stone, with on open well-hole left clear for purposes of experiment, communicates with all floors.

The building is constructed of brickwork, or Fletton bricks laid in cement, faced with Portland Stone on the face next the quadrangle and next Gower-street, and partly so on the return or south face, and rests on a cement concrete foundation. The internal walls of the engineering laboratory, the lecture-theatre, and several other portions of the buildings are lined with white glazed facing-bricks. The roofs are constructed with steel trusses and slated, and have ample skylights.

The architectural treatment of the original building has been followed on the front next the quadrangle without any variation. On the Gower-street front, in dealing with which the architect was not so rigorously compelled to conform to the original, all the main lines of cornices, strings, &c., are equally carried through, and the architectural details are adhered to, but such minor variations as convenience called for have been introduced ; as, for example, the windows of the ground story are slightly larger than in the old building, and for part of the front an upper range of windows, to give light to the top story, has been introduced.

Of the elevation towards Gower-street only six bays of the south block are at present completed to the full height, and eleven more are carried up to the string-course above the ground-floor windows.

The whole of these new buildings are to be lit electrically by incandescent lamps ; but provision has also been made for gas-lighting throughout. The advantages of the electric lighting in the lecture-rooms and drawing-room will be manifest.

The present engineering laboratory of the College will be rearranged for the use of the Department of Physics. A New Physical Laboratory has already been built in the rear of the College, and is now in use.

This building forms a compact block measuring 34 ft. 3 in. deep by 88 ft. 6 in. long, the centre part being two stories high, and the sides one story only. On the ground floor three laboratories are provided : two are large ones, measuring each 33 ft. × 32 ft., and with an open roof ; the centre room measures 25 ft. × 18 ft., and a fourth room of the same dimensions is provided above it. Ample light and good ventilation have been provided, and in the three principal laboratories a firm floor of solid deal blocks on concrete, resting on the earth, furnishes a stable base on which any kind of delicate apparatus can rest free from vibration. Solid stone slabs resting on stone corbels carried by the walls themselves are supplied throughout, and gas and water are carried to every part. The building is so arranged that an uninterrupted length of 86 ft. is available for experiments on light. In connexion with the upper room, a complete dark room, with all the fittings required for photographic work, has been introduced. A second floor can be added over either or both the large laboratories if found desirable. The whole has been solidly but simply constructed in brickwork, and provides part of the accommodation required by the professor of physics.

The classes which cannot be taught here will be provided for in the two lower floors of the library wing, most of which has hitherto served as an engineering laboratory and lecture-theatre. Here a general and an electrical laboratory, a lecture-theatre, apparatus-room, class-rooms, professor's room, balance-room, and other accommodation will be furnished ; and this very important department will be far better housed than it has hitherto been, while the removal of Professor Carey Foster's classes and laboratories will render it possible to provide enlarged and improved accommodation for the Professor of Hygiene and his laboratory, and for bacteriology in connexion with hygiene. A lecture-theatre and rooms in the same division of the building will also be appropriated to the classes of pure mathematics. In each case fittings and other appliances are to be rearranged, a course which no doubt adds to the expense of the present undertaking, but with the result that the important department of physics will reap almost as much benefit from the changes being made as the two departments for which the new buildings are being specially provided, and that the conduct of other branches of the college work will be facilitated.

We will now proceed to speak in detail of some of the arrangements of the new laboratories, which are to be opened for work in October next, at the commencement of the new term :—

The cement testing-room will be fitted with stone benches for gauging work, with cement tanks beneath, in which the briquettes may be placed to set ; another bench carries the testing-plant and other accessories. The Calorimeter room will be fitted with lead-covered tables and sinks, and with benches for chemical work. Here fuels will be tested for their calorific power and furnace gases analysed, &c. The arrangement of the other parts of the engineering laboratory can be clearly seen from the plan which we give. The engine-room will be screened off by a glass and wood partition. The engine will be a 25 h.-p. vertical compound engine, and power will be taken up by rope brakes. It will be used only for experimental purposes. In the same room it is proposed to have a small high-speed engine of the type largely used in electric lighting ; this

* Much better than it will be in the future when the buildings are completed, for in addition to the windows on the east and west sides the provisional roof (which will be jacked-up as the building is increased in height and will form the permanent roof of the top story) is provided with a skylight.—ED.

will be used both for testing and for power purposes. Steam will be supplied to both from a boiler to be set up in the boiler-house, which is on the basement level, but outside the walls of the laboratory. The gas-engine just outside the engine-room is a 8 h.-p., and will drive the lathes, milling-machine, &c., by a main line of shafting carried on brackets on the walls, and countershafting supported on A frames.

In the dynamo-room is another gas-engine of 9 h.-p. (which will indicate up to 19 h.-p.), by Messrs. Crossley Brothers. The exhaust-box and silencing chamber, and a new starting gear (both features of much interest), are placed in brick pits in one corner of the room; over these are water tanks and pipes, to supply a continuous stream to the cylinder jacket. There is further an arrangement for giving this supply through water-meters for the purpose of thermo-dynamical measurements. From this engine may be driven a Crompton 10 h.-p. shunt-wound dynamo, by means of one pulley; from the other pulley is driven a counter-shaft, which is carried through into the engineering engine-room, so that the counter-shaft can be driven by steam when required. This gas-engine is the only machine at present *in situ*. Its silencing chamber, filled with pebbles, will, it is stated, entirely prevent the disagreeable noise of the exhaust, and which would not be at all conducive to the well-being of the patients in University College Hospital, just opposite.

It is proposed to place in this room a machine expressly for testing and experimental purposes, whose design is as follows: There are four machines bolted into the same bed-plate, two of these are similar Kapp continuous current motors, and on the same shafting with each is a Kapp alternator, which will be driven by the motor. These alternators are side by side, and can be rigidly bolted together with the armature bobbins in any desired relative position. The motors can be driven by accumulators placed in the basement, or one of them can be run as a motor and the other as a generator.

South of the dynamo-room is a lecture-room, and behind the lecture-table are placed the battery, switch-board, and switches for controlling the supply of current to the whole of the rooms and to the lecture-table. This last is supplied with alternating and continuous current, and also with gas and water for illustrative experiments. A large apparatus-room behind the lecture-room is similarly supplied, and will contain the lecture apparatus and instruments. Beyond there is a large electrical laboratory, the chief feature of which is the large stone slabs built into the wall to serve as steady tables for the more delicate instruments. The electric mains are carried in chases across and around the floor of the room, which are covered in by floor-boards. The photometer will be in a small gallery 30 ft. long and 6 ft. wide at one end of the laboratory, and there is a dark room at the end of this gallery for photographic work.

In the basement, besides the accumulator room (for which ample provision for ventilation is made), there will be a carpenters' shop and pattern-room, and a forge. The upper stories of the building are not yet complete. On the first floor will be the Engineering lecture theatre, with its apparatus-room, a class-room and private-rooms, and another photographer's dark-room. Adjoining will be a museum which will contain specimens of ore, manufactured iron, cements, &c., and models of mechanism and structures. On the top-floor will be the drawing-office, lighted by skylights in addition to the windows. The well of the staircase affords an opportunity of testing long wires or carrying out pendulum experiments. The floors are made sound proof (with silicate cotton or slag-wool), a matter which is of some importance in view of the near neighbourhood of the engine and dynamos.

The general contractors for the new wing are Messrs. A. Bush & Son, and the constructional steel and iron work has been furnished by Messrs. Richard Moreland & Son. The contractors for the Physical Laboratory were Messrs. Brown, Son, & Blomfield.

THE SANITARY INSTITUTE'S EXAMINATIONS FOR INSPECTORS OF NUISANCES.—At an Examination for Inspectors of Nuisances, held in Exeter on May 26 and 27, nineteen candidates presented themselves. Questions were set to be answered in writing on the 26th, and the candidates were examined *viva voce* on the 27th. Thirteen of the candidates (one being a lady) were certified to be competent, as regards their sanitary knowledge, to discharge the duties of Inspector of Nuisances.

CHELSEA INFIRMARY EXTENSION.

IT is proposed by the Chelsea Board of Guardians to build additional accommodation for, and adjoining, the present Infirmary in Cale-street. The site is a corner one, being at the junction of Cale-street and Sydney-street, with a frontage of a little over 70 ft. to the former and 60 ft. to the latter. The accommodation required was for a medical superintendent's house, and bedrooms for forty-two night and day nurses, and two superintendent nurses. It is to be a building of four floors, standing on a basement. The frontage in Cale-street is to be kept back to the line of frontage of the existing Infirmary.

Six sets of designs have been sent in, and will be on view at the offices of the Board in King's-road until June 6. We are given to understand that the award has not been yet made, but will be shortly.

The various sets of designs have been distinguished by letters. The plans vary but little from each other, the rooms forming the doctors' residence being placed on the Sydney-street side, whilst the nurses' rooms face Cale-street, and have access to the Infirmary. In the basement a large recreation room for the nurses has been provided, as well as bath-rooms and other offices and stores. The doctors' residence is provided with two sitting rooms, and a study and several bedrooms, the rest of the building being entirely taken up with bedrooms for the nursing staff.

Although the site is not quite rectangular, "O." and "H." have designed these blocks with the frontages at right-angles to each other, the differences in width being given in the areas. This has a more symmetrical look on plan, and not much space is apparently wasted. The others have drawn their frontages parallel with the lines of the site. A separate staircase conducts to the nurses' rooms, with an entrance from Cale-street. In most cases this staircase is placed at the back of the block; in one case, however, it forms a special feature in the front. With respect to the elevations, not much can be said; few are above the commonplace, and more than one is bad. "X." has a simple frontage with a slightly projecting centre to the Sydney-street front, and circular windows in the top story. A slight projection with a gable is shown at the angle of the site, balancing the projection at the opposite end (of the existing building), and a far more satisfactory feature than the angle turrets shown on some of the others—a feature which we must confess to be somewhat tired of in our London street corners.

THE ARCHITECTURAL ASSOCIATION:

CLOSING MEETING OF THE SESSION.

THE final meeting of this Association for Session 1892-93 was held on Friday evening, May 26, in the meeting-room of the Royal Institute of British Architects, Conduit-street, Mr. H. O. Cresswell, President, in the chair.

Mr. A. M. Husbands was unanimously elected a member.

On the motion of Mr. E. S. Gale, Hon. Sec., seconded by Mr. E. A. Rüntz, cordial votes of thanks were accorded to the A. A. Lyric Club for the entertainment they provided on the occasion of the Members' *Soirée;* and to Messrs. Broadwood & Co., Messrs. Sugg & Co., Messrs. Colls & Sons, and Messrs. Brass & Co., for their assistance on the same occasion.

Mr. Gale also announced a donation, by Mr. R. Holmes (one of the Instructors), of 8*l.* 8s. to the general fund of the Association. A hearty vote of thanks was accorded to the donor.

Mr. F. T. W. Goldsmith, Hon. Sec., announced that the first Summer Visit this session would be made this Saturday, June 3, to Chenies, Bucks.

Election of Officers and Committee.

The scrutineers appointed to count the votes in the election of officers then made their report, the result of which was declared to be that the following were elected:—

PRESIDENT: Mr. E. W. Mountford, F.R.I.B.A.

VICE-PRESIDENTS:—Messrs. W. D. Caröe and E. S. Gale.

MEMBERS OF COMMITTEE:—Messrs. J. Begg, A. C. B. Booth, H. O. Cresswell, A. W. Earle, F. R. Farrow, Theo. Moore, E. A. Rüntz, W. H. Seth-Smith, Paul Waterhouse, M.A., and E. Woodthorpe, M.A.*

HON. TREASURER: Mr. H. W. Pratt.

HON. LIBRARIAN: Mr. J. W. Stonhold.

HON. SECRETARIES: Messrs. F. T. W. Goldsmith and B. F. Fletcher.

[The foregoing form the Committee.]

HON. SOLICITOR: Mr. W. H. Jamieson.

HON. ASSISTANT LIBRARIANS: Messrs. C. H. Freeman and A. T. Griffith.

HON. AUDITORS: Messrs. E. C. Pinks and B. Dicksee.

ASSISTANT SECRETARY AND REGISTRAR: Mr. D. G. Driver.

Mr. Woodthorpe, in proposing a cordial vote of thanks to the retiring Hon. Sec., Mr. E. S. Gale, referred in appreciative terms to Mr. Gale's labours during the past four years, especially in connexion with the new educational scheme of the Association.

The President, in putting the motion, expressed his cordial agreement with what had been said of Mr. Gale's services.

Mr. Gale briefly replied.

The Travelling Student's Notes: Norfolk.

Mr. T. A. Sladdin then read the following paper, descriptive of a tour he made as last year's A.A. Travelling Student:—

Having been awarded the Travelling Studentship I consulted some authorities, and decided upon Norfolk as my field for operations.

I find when the time comes to read the paper that choosing such a well-known county makes it very difficult to say much that is not already known to most of you, so that you will find this but a brief outline of my tour.

I may say here that my tour was made the more pleasant by having two friends with me most of the time, consequently, throughout the paper, I am constantly using the plural pronoun we—and I must take this opportunity to thank Mr. Newton for allowing me to add some of his sketches to my own in order to more fully illustrate my remarks.

Norwich was my first stopping-place, and I must say that my feelings on first seeing it were those of disappointment at the insignificant situation the Cathedral occupied; it seems difficult to understand why the founders did not select a more imposing site—such as the high ground which rises directly on the other side of the river—in fact, the only spot from which a really good view of it can be obtained is from the river opposite a delightfully picturesque old fifteenth-century archway known as Pulls Ferry. The fine outline of the tower and spire is here seen to advantage, although a closer inspection discloses some hideous detail.

Those who have seen Norwich Cathedral will agree with me that the finest part is undoubtedly the interior. Entering from the west end, which externally is so poor in design, one is at once impressed by the magnificent range of Norman arcading and perpendicular vaulting. The choir, which is of great length, has some exceedingly fine stalls, good examples of fifteenth-century woodwork.

The whole of the east end, including the choir, was undergoing restoration, and I was grieved to notice, particularly in the south transept, that the stonework was being scraped down, and the mellowing effect of ages was being totally destroyed.

In the south aisle of the chancel is a most beautiful font in rather a mutilated condition. The carving in the panels represents the Seven Sacraments and the Crucifixion. The way in which the small shafts are treated, running up under the body of the font, with angels filling up the space between, is very pleasing, and to my mind the whole design is most happy. It belonged at one time to the Church of St. Mary in the Marsh, a church that has now been demolished some years; the people of this parish, curiously enough, are allowed to use one of the two chapels in this aisle as their place of worship.

The other chapel in the south aisle is the Beauchamp Chapel, used now as the Consistory Court. It has in it a fine shrine of that period when Perpendicular was at its best.

South of the Cathedral, and reached from the south aisle of the nave, are the well-known and much-admired cloisters. I have no time in a paper of this length to describe them, but any students visiting Norwich will find them well worthy of careful study.

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* The names are here given in alphabetical order, as at first announced. Subsequently it was resolved that the number of votes given to each candidate should be announced, with the following result:—H. O. Cresswell, 212; P. Waterhouse, 191; E. Woodthorpe, 185; F. R. Farrow, 180; E. A. Rüntz, 167; A. C. B. Booth, 162; Theo. Moore, 154; A. W. Earle, 150; W. H. Seth-Smith, 142; J. Begg, 136. A motion to read the number of votes given to unsuccessful candidates for the Committee was rejected. The scrutineers reported that they received 261 papers, of which nine were informal, the number of valid papers being thus 252. The Association, we may add, has about 1,200 members on its roll.

It may interest you to know that a charge of 4s. 6d. a week is made for sketching in the Cathedral. I think this is a case for our secretary.

Turning our attention now from the cathedral. On the upper side of the extensive market place and hemmed in on all sides by old houses, stands the fine Perpendicular church of St. Peter Mancroft, restored some years ago by the late Mr. Street. This is one of the few churches in Norwich that is not faced with flint work, and like several others in this district has its clearstory windows very close together, two over each nave arch.

The church has numerous interesting features inside, the most noticeable one being the baptistery near the north porch, which has lately been most admirably restored by our late President, Mr. Baggallay.* The entrance lobby, of which I have measured drawings, is in the south transept, and has a carved frieze unusually fine in design.

In the small church of St. George Tombland, is a very remarkable font and cover; the measured drawings which I am able to show you have been kindly lent by Mr. Newton The outline of the sturdy little granite font gives one at first the impression of its being of pre-Norman times, but the pointed arched heads to the shallow panels on the body of the font, fix its date, I think, to the early part of the twelfth century. The cover is late Jacobean, and seen in perspective the whole thing is exceedingly picturesque. In the church at Knapton there is a font identical in design, though slightly larger.

In the same church is an oak pulpit with sounding-board over; it formerly stood on wooden posts, but unfortunately no trace of these remain, and at present the pulpit stands on a hideously modern solid base. The small staircase has some very delicately moulded balusters; but perhaps the most noticeable point about the pulpit is the ivory inlay, which is profusely used in the panels and soffit of sounding-board. Such work is rare in England at least.

In one of the chief churches of Norwich, called St. Andrew, Broad-street, is an extremely fine wooden screen. The west tower is open towards the nave, and this screen stretches across the opening and reaches from the nave floor up to the ringing chamber in the tower. From the time of the Reformation, and, I believe, until recently, it was covered over with lath and plaster; when uncovered it must have been in a very dilapidated condition, because all the present mullions and panelling in lower part are new, only the old jambs and tracery over remaining. Unfortunately when the screen underwent restoration, by some mistake, its original height was reduced by a foot. In my measured drawing of it the error is rectified.

The chief landmark in Norwich is the Castle, standing as it does on a tremendous mound. It is supposed to have been built in 1020, but externally little remains by which one may judge, the whole of the present outside casing being about fifty years old. From the terrace, which runs all round, a good view is obtained of the city, and some idea can be formed of the great number of churches it contains.

In all directions their towers can be seen peeping up above the trees, which abound everywhere. One is immediately struck by the great similarity of design between all these towers, which is still more observable on closer inspection. This sameness, of course, detracts greatly from their interest, and, indeed, a visit to two or three of the forty churches of Norwich will be found amply sufficient to gain a general knowledge of their characteristics.

There are numerous places of interest within easy walking distance of Norwich; some of these I visited. Thorpe, I think, is the nearest; this straggling village is very pleasantly situated on the river, east of the city on the Yarmouth road. The old hall was built on the site of a Bishop's Palace, and is a sleepy looking old house with very pleasant garden surrounding it. We took a boat here, and by going with the stream for about three-quarters of a mile we reached a half-timbered house, nicknamed by the wherrymen the "Monkey House." It is occupied by the people who have charge of the ferry at this spot, and I thought quite merited a sketch.

Not far from Norwich, but in the north-west direction, and also on the river, is an interesting old Elizabethan house. It was once the Palace of Bishop Hall, built in 1587, but is now used for quite a different purpose, being known as the "Dolphin Inn." It stands some distance back from the road, with square courtyard in front. The entrance gates are gone, but the large gate piers still remain. I had intended bringing away some record of the front, but unfortunately the weather at the time was not favourable for outside work, and I had to content myself with sketching the ceiling in the bar parlour.

A mile or so further on is the diminutive village of Hellesdon, with a church in proportion, but I saw nothing very noteworthy.

At Costessy, which is in the same direction, but about five miles from Norwich, is the seat of Lord Stafford. I was extremely curious to see the house, as my guide-book laid particular stress upon the beautiful chapel, which was designed by one of the family: but I was not fortunate enough to gain admission. The church, however, well repaid the journey. It is Late Decorated, with good altar-screen, and some curious Transitional windows. For a water-colour study, it would form a good subject, with its brick tower and wooden spire.

From Norwich we went to North Walsham, which forms a capital centre for reaching such places as Trunch, Knapton, and others which have no railway communication.

The only drawing I made in North Walsham was of the wooden font cover which is suspended from a beam across one of the nave arches.

Trunch is a three-and-a-half mile walk from North Walsham, and as in most of the villages, I saw the church was the chief attraction. It has a splendid hammer-beam roof, which is so well known as to need no description of mine. The baptistery, which is of wood, is in marvellous preservation, and is certainly one of the best things we saw; it is of very similar character to that in St. Peter's Mancroft.

Knapton is about the same distance from North Walsham, and is famous for not having refreshment for "man or beast." The church itself is like a large empty box, but the roof is exceedingly fine. I attempted a sketch of the roof, but not being very successful, and feeling for once rather slack, and being very near the coast, I walked on to Mundesley, a quiet little watering-place not boasting any railway communication, but I must in fairness say that it is possible to get something to eat here.

The church—St. Mary's—is in a very ruined state, but the tower has been lowered and roofed in, and is now used for service. We had a pleasant coach-ride back to North Walsham.

Whilst staying at North Walsham, we spent one day at Worsted, which is a particularly pleasant walk. The village now is a mere shadow of its former importance, but fortunately the magnificent church still remains a monument to the former wealth and liberality of the Flemish inhabitants. I am sorry to say that the church is now neglected; it is very dirty, and the roof does not fulfil its purpose. I have sketches of the south porch and nave roof, and one of Mr. Newton's of the western screen between tower and nave.

Our next move was to Aylsham, the leading town in this part of the county. The church is of considerable size, and still retains traces of its former interest, in spite of the most thorough restoration:—

> "You may break, you may shatter the vase as you will,
> But the scent of the roses will cling to it still."

In the restoration of the church the upper part of the old chancel screen was removed, and now does duty as a reredos. I am glad to say the lower part still remains in its old position, and is noticeable for its delicate Gesso work. The proportions of the church, to my mind, were totally destroyed at the same time by the introduction of solid backed pews, which are everywhere sprinkled with tasteless carving.

The font is of great interest. The eight sides are filled with sculpture representing the emblems of the Passion, the four Evangelists, and the Crucifixion. Carved on the base are the arms of the founder of the church, John of Gaunt, inserted in richly-traceried panels. This font owes its splendid state of preservation to the fact that, until lately, it was hidden from view under a mass of rubbish in one of the aisles.

Another good feature in the church is the ringing gallery under the western tower, which seems to be a general arrangement in Norfolk. This gallery is supported on wooden posts from which spring arches, the spandrels being filled with delicate tracery, and the whole retains its original colouring. The fine old Early English hinges at the western entrance do not benefit by being attached to painfully new doors. The tracery in the windows shows an extraordinary amount of variety, and adds greatly to the interest.

The pulpit is a typical example of Jacobean woodwork, with its panels in false perspective. The stairs are a recent addition, and are the best modern work in the church.

The exterior is a charming example of a characteristically English church, rising, as it does, from the greenest of turf, and backed by magnificent cedars. The south porch, which was quite the finest I saw in my tour, is worthy of close study, not only on account of the beauty of its proportions, but also for the refinements of its mouldings.

Aylsham contains more than the usual amount of that delightfully quiet domestic work, the charm of which is largely to be attributed to the hand of time.

The end of my tour was spent at Blickling, which is a tiny village clustering round the gates of Blickling Hall, the magnificent seat of the Marquis of Lothian. No words of mine can convey the exquisite charm of this stately home. The approach to the house lies between yew hedges 15 ft. high, which are clipped with marvellous precision. The upper part of this forecourt is flanked by low wings, the one on the left containing the kitchens, and that on the right the stables; these are connected to the house by colonnaded screens.

The house forms an oblong on plan, the corners being accentuated by towers; it is surrounded by a moat, which is now dry and laid out with flower-beds. To enter the house you cross a bridge and pass through a massive door into a small inner court, out of which open the grand hall and staircase, so well known. The iron knocker on this door I have just mentioned is a unique specimen as far as my experience goes. Worked into the design is the Bull's Head—the crest of the "Kerrs"—which also appears in other positions in the building, and forms a valuable precedent for the treatment of armorial bearings in a decorative way.

Proceeding to the first floor, the doors at each end of the gallery, which lead to the State apartments and bedrooms respectively, are worthy of study. As will be seen in my sketch, the stonework is very cleverly treated, and the carving has a marked resemblance to foreign work of the same period.

The ante-room to which one of these leads is a square apartment, the ceiling of which is more severely treated than any of the others, as will be seen from the plan. The transition from the square to the octagon is skilfully managed. This room is one of those which overlooks the wonderful garden, which, when seen ablaze with flowers, under a summer sun, will not be readily forgotten. This ante-room opens on one side into the State drawing-room, the most noticeable feature of which is the impressive chimney-piece (sketch); the proportion of this is very fine—the rich colour of the woodwork blending very harmoniously with the delicate white of the elaborate plaster ceiling. This room contains a wealth of art in the shape of furniture and portraits of notable people by notable artists.

The other room opening out of the ante-room before mentioned is the library, a noble apartment 120 ft. in length, sadly spoilt by the introduction of a rabid Gothic hooded chimney-piece and equally unpleasing bookcases which do not in the least harmonise with the character of the room. I was informed that to make way for these alterations a splendid Jacobean chimney-piece was removed, which was at once bought by a well-known art collector and re-erected in his own country house. Lately restorations have happily been unattended by such disastrous results. The ceiling in this room is also of marvellous richness, a perfect mine of ideas, the ceiling in each projecting bay window being very freely treated with strap-work ornament, birds, flowers, and fruit carved with all that vigorous spirit peculiar to this period when plaster-work probably attained its highest development.

The modern stained-glass inserted in the window at the end of the room compares favourably with much of later date. Before leaving this room, mention may be made of the noble collection of books, one of the finest in England, and which are very jealously treasured.

At the end of the Library a door leads into the the suite of apartments furnished in honour of a visit of one of the Georges, and presenting a most interesting contrast to the sturdy vigour of the other part of the house; being of that weak but delicate style known as the Adam's period, which is so much studied by some of our rising men at present. The further apartment contains the King's bed, and some other excellent pieces of furniture.

To mention in detail the many other features of this fine old mansion would dip too deeply into your time, which I know you require for the

* For view of the restored font and canopy, see *Builder*, Jan. 4, 1890.

pressing business of the evening, but I may tell you that some of the most pleasurable moments of my tour were spent when I was making the sketch of the entrance front. At the close of the afternoon, when the sun slowly sank to rest "and all the air a solemn stillness held" the opalescent tints of the sky, combined—with the mellow old brickwork, and varied shades of green in the trees and grass, softened in the fading light—to make up a picture infinitely precious to the jaded London draughtsman. At such moments my feelings of gratitude towards the Architectural Association were lively. My thanks are also due to Lady Lothian for her extremely kind permission to sketch both inside and outside the house.

The interest of the Hall so overshadows that of the church that I need only mention the latter briefly.

It was fully restored by the late Mr. Street, who also added the tower. The interior contains some good brasses, and the curious "Clere Monument," with its numerous fictitious coats of arms.

The late Marquis of Lothian's monument (his reclining figure supported by angels) is a magnificent piece of sculpture by Watts, R.A.; it is a pity that the immense block of marble is veined in places.

The country round Blickling abounds in interest, but I deemed it better to confine myself to the thorough study of one place, than to roam about the country getting rapid impressions and making hurried sketches. One Sunday I walked out to see Barningham Hall, which lies in lovely country, and is considered an admirable example of that late seventeenth-century work which has been reproduced with such success by that accomplished architect, Mr. Ernest George. Some distance from the house are the remains of a Late Decorated church, which curiously enough have to be passed through to enter the present church. Walking back I observed the fine tower of Erpingham Church, which I was unfortunately unable to enter. I was astonished to to see the name of Cardinal Wolsey on a tombstone in the churchyard, as I had not known that that famous prelate was buried in this out-of-the-way spot. But on further examination I discovered that half the occupants of the churchyard had borne the name of Wolsey in life, and that the "Cardinal" in this case was only a christian name conferred on her offspring by some ambitious mother who wished to render her son immortal.

It was with feelings of regret that we bade adieu to the hospitable host of the "Blickling Arms," who with his charming daughters did so much to render our stay under their roof an enjoyable one.

Norfolk people, in my opinion, bear off the palm for genuine hospitality. I was everywhere treated with unfailing kindness, and every facility put in any way for the proper study of our noble art.

I have noticed with pleasure that the A.A. excursion this summer starts from Beccles, which is within easy range of the district I have traversed to-night, and I feel that my paper will not have been altogether in vain if it should induce any member who has not already decided to take part in it this year, to do so at once.

In conclusion, gentlemen, I have only to express my thanks for the great honour you conferred upon me by giving me the studentship, which, besides affording me the pleasantest of holidays, has been to me an invaluable opportunity of study, and however imperfect my efforts may appear, I can assure you I have striven to the utmost to make profitable use of my time.

In the discussion which followed,

Mr. Walter Millard said he had great pleasure in proposing a vote of thanks to Mr. Sladdin for his paper. With regard to his remark about the situation of Norwich Cathedral, it should be remembered that there were other cathedrals situated on low ground—Salisbury and Winchester, for instance. The tall spire at Norwich helped considerably in giving dignity to the cathedral; a curious thing about it was that it was the only ancient tall stone spire that he had met with in the whole county of Norfolk, although there were a few lead ones. He did not want to blame Mr. Sladdin for sticking so much to old work when on his sketching tour as Travelling Student of the Association; but he should have liked to hear what he thought about another cathedral now being erected in Norwich—viz., the Roman Catholic Cathedral, which was being built on the high ground under the direction of one of the most distinguished architects of the day, Mr. Gilbert Scott. He did not think that the young architect of the present day should altogether ignore new work, but should go about with his eyes open to see what was good both in new and old work, for after all it was all one, only chopped up into lengths, for convenience, by the writers of books. In addition to the ceiling at the "Dolphin" inn, spoken of by Mr. Sladdin, there was a very interesting newel staircase. North Walsham, Trunch, and Knapton formed a cluster of places containing as fine work as it was possible to see, and he thought that Mr. Sladdin deserved credit for having devoted some attention to those places, as well as for having kept himself to a limited district; at the same time he must have gone very near to some very fine things which he had not mentioned. To pass away from the immediate subject of Mr. Sladdin's paper, he (the speaker) hoped he might be permitted to say a few words upon sketching tours generally. He thought that students generally would do well to remember that there was a far more important question for them to consider than the way in which they should make their sketches, viz., that of deciding what to sketch. The mere execution of sketches was quite a secondary thing, although it was necessarily the first thing which the student thought about. It was only when a man became a little advanced, and had had time to think, that he perceived the importance of considering what he should sketch. What a student knew before he started determined, to a very great extent, what he wanted to know. If he had any independence of mind he would probably start on a sketching tour with some sort of fondness for some of the different kinds of things which he would see; and he thought it was no bad thing for the young student to be pretty strongly influenced by the work of older men, or even by that of some one man. A little hero-worship was a good thing for a student to build himself upon. Let him look out for work such as So-and-So did; let him say to himself, "Well, if I do not know my own mind as to what I want, I will try to see what somebody else seems to have studied." The young student who approached his work in that spirit, if he had any independence of his own, would soon find his footing, and know what to do to develop his own powers. It was far better to adopt that course than to go aimlessly about making sketches because one had to make them. There was one other point about which he wished to say a word, viz.: that while the Association did a great deal for what he might call the indoor education of the young architect, it did very little for his outdoor education—in the way of teaching him from the buildings themselves. He should like to see the Association with a dozen Travelling Studentships at its disposal, instead of only one, for he was afraid that young architects did not think enough about learning directly from the buildings themselves. He had been greatly struck lately in reading Quatremère de Quincy's "Lives" at the extent to which the great architects of the Italian Renaissance carried the practice of learning from buildings themselves. Bramante and others, although they were duly apprenticed to various arts, travelled about studying from executed works. Of course it was quite true that there were few books in those days to study from. He did not wish to speak lightly of books, but architecture could not be learnt from books alone.

Mr. E. W. M. Wonnacott said he had great pleasure in seconding the vote of thanks to Mr. Sladdin. He thought that one advantage of having the Travelling Studentship, in addition to that derived from the opportunities of sketching which it afforded, was that it induced at least one member to come forward annually and face an Association meeting with a paper for the first time. He wished to make one suggestion which he thought was worth consideration, viz., that in future when the Travelling Student of the year read his paper and submitted the sketches which he had executed as the Travelling Student, that he should exhibit at the same time the work by which he gained the Studentship. He thought that it would be interesting to see both sets of sketches side by side.

Mr. P. E. Newton, who was called upon by the President, said that although he had had the pleasure of accompanying Mr. Sladdin during part of his tour, he feared he had nothing to add to what Mr. Sladdin had already said, except with regard to the new Catholic Cathedral at Norwich, which he should certainly have mentioned himself if he had been writing a paper about the architecture of Norwich. Although he thought that the exterior of the building was rather flat, he was very much struck by the interior, which he thought was one of the finest pieces of modern Gothic work that could be seen.

The President, in putting the vote of thanks to the meeting, said he thought that Mr. Millard in his remarks had made some very good suggestions which future Travelling Students of the Architectural Association would do well to attend to, especially with regard to keeping their eyes open for new work of good character. There was a great deal to be learnt from the study of old work and new work side by side, and he thought it would be very unwise not to study new work by men of acknowledged repute as architects. It was, of course, one of the great difficulties of a young man on his first sketching tour to know what to select and how to select it. Perhaps Mr. Millard's suggestion was as good as any that had been made—to follow the lead of some man who had been before him. Mr. Sladdin had very wisely confined himself to a small district and had studied that thoroughly. He (the President) remembered that Mr. Waterhouse, in an address which he delivered to students at the Institute some two years ago, said that students in the present day seemed to have some of the energy begotten of the steam-engine and they went flitting about the country at a great rate, seeing a great deal, spending a great deal in railway travelling, but learning very little. He was glad to think that students were beginning to see that they could learn a great deal more by keeping to a limited district at one time and studying the work of that district thoroughly. Mr. Sladdin had done that and had confined himself to a small number of churches. He was rather afraid at first that Mr. Sladdin was going to treat of nothing but church work, but he was very pleased to find later on that he had not neglected domestic work, and that he had reserved to the end of his paper some remarks about one large building which he had studied very thoroughly, viz., Blickling Hall. The student who was going on a sketching tour should choose his buildings carefully, and he would do well to consult beforehand someone who knew something of the district which had been selected. Above all, he should endeavour to select some one or two buildings that he should study thoroughly from top to bottom. Such a course of procedure would not only be economical in respect of both time and money, but would be really more instructive to the student, as he would learn a great deal more in this way than in passing hurriedly from one building to another and taking note only of details here and there. Mr. Millard had suggested that the Association might perhaps do more than it did at present to encourage the out-door architectural education of its members; but there were, of course, difficulties in the way of doing that, desirable as it was, for he quite agreed with what had been said as to the importance of studying architecture from buildings themselves, and not merely from drawings and books. He thought, however, that Mr. Millard had rather forgotten the Spring and Summer visits of the Association, which did something to enable the members to study architecture from buildings, both old and new. It was, of course, quite true that those visits were very brief and hurried, but he thought that members who desired to study at greater leisure the buildings thus visited would be able to obtain consent to do so—in most cases, at all events. He thought that Mr. Wonnacott's suggestion—that the A.A. Travelling Student of the year should exhibit the work by which he had gained the studentship, as well as the work which he had done as the Travelling Student—was not a bad one. Possibly the fact that the student knew that his work done in two separate years would be exhibited side by side would serve as a wholesome stimulus to him—not that he thought that, so far, their Travelling Students' work had shown any falling off as compared with the work by which they had gained the studentships.

The vote of thanks having been carried by acclamation,

Mr. Sladdin, in reply, said he thanked the meeting for the kind way in which they had received his paper, and Mr. Millard, Mr. Wonnacott, and the President for the suggestions which they had made. With reference to the new Roman Catholic Cathedral at Norwich, he had intended to refer to it. It was in a splendid position—the finest that could be had in Norwich—on the high ground. He agreed with Mr. Newton's remarks with regard to the exterior; in his (the speaker's) opinion the windows were too shallow; they had not sufficient reveal, and several of the main mouldings seemed to him to be very hard, and appearing almost like cast-iron.

The interior, however, was a pleasing contrast to the exterior.

The meeting then terminated.

The Annual Dinner.

The annual dinner of the Association was held on Wednesday evening last at the "Criterion," Mr. H. O. Cresswell, the retiring President, in the chair.

After the toast of "The Queen and Royal Family" had been duly honoured,

The Chairman proposed "The Royal Academy," which, he said, although one of the best-abused bodies in this country, had nevertheless some claim to gratitude from architects for the work which it had carried on in its Architectural School. In saying that, he did not mean to convey the idea that that School was perfect in its methods; on the contrary, he thought that the feeling in the profession was very largely in favour of reform in the School, which it was felt ought to be brought more up to date. With the toast he had great pleasure in coupling the name of Professor Aitchison, A.R.A.

Professor Aitchison, in replying, referred to the early history of the academy, and said he thought that, in spite of its critics, it had done a great deal for art since it was founded. Genius only came when Nature sent it to us, and no academy could create it; but what an academy could do was to seek to maintain a high standard of excellence in anything that could be taught, and he thought that in that direction the academy had done good work. In painting, for instance, he thought there could be no question that the bulk of the work exhibited in the present day was very superior, in technical skill and knowledge, to the work exhibited fifty or sixty years ago. After an amusing reference to the disproportionate number of painters and sculptors in the Academy, compared with the few architects admitted within its ranks, Professor Aitchison concluded by alluding to the question of reform in the Architectural School of the Academy. The system now pursued there was very much what it had been from the commencement, and was based almost entirely on the old Renaissance traditions. Whether the Academy would ever establish professorships or classes in Statics would, he thought, largely depend upon the views expressed by the architectural profession itself as to whether construction was or was not an integral part of architecture.

The Chairman next proposed "The Royal Institute of British Architects," coupled with the name of Mr. J. Macvicar Anderson, the President of the Institute.

Mr Macvicar Anderson, in replying, expressed his great gratification at the very cordial relations which exist between the Association and the Institute.

Professor Kerr next proposed "The Architectural Association," of whose efforts in the cause of architectural education for so many years past he spoke in terms of the warmest commendation. The members were, he thought, especially to be admired for their pluck, as a body of young men, in establishing two years ago what was no less than a College of Architecture.

The Chairman having replied,

Mr. E. S. Gale proposed "The Instructors and Studio Visitors," coupled with the name of Mr. Cole A. Adams, who briefly replied.

Mr. F. T. W. Goldsmith, in a lively speech, proposed "The Visitors," coupled with the name of Mr. Walter Crane.

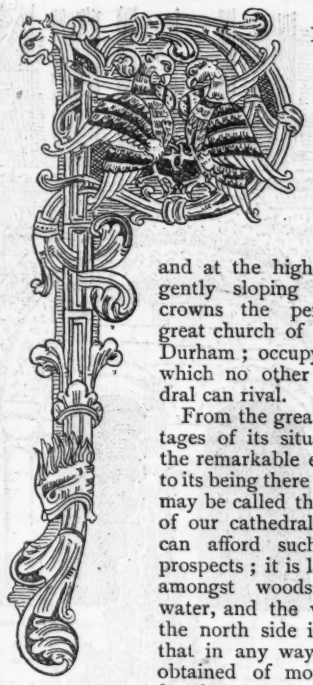
Mr. Walter Crane made an interesting speech in replying. He said he felt the profoundest veneration for architecture, as he regarded it as the fundamental art—the greatest art of all—the art that was of more importance to the expression of national life than any other. But he feared we should not have good architecture again until there was greater unity and contentment amongst all classes of the people, and until all the workers on a building, from the workman to the architect, would work together with one consentaneousness to a noble end.

The other toasts were "The President Elect" (proposed by the Chairman, and replied to by Mr. E. W. Mountford, F.R.I.B.A.), and "The Retiring President and Officers," proposed by Mr. E. W. Mountford, and responded to by Mr. Paul Waterhouse, M.A.

ERRATA.—The two foot-notes on pp. 406, 407 of our last number, referring to the Manchester Main Drainage Works and to the Ship Canal, should have mentioned the *Builder* for May 13, and not May 6.

Illustrations.

DURHAM CATHEDRAL.*



ROUDLY seated on a rock, at the head of a small peninsula formed by the river Wear, winding and doubling on its course; and at the highest point of the gently sloping plateau which crowns the peninsula, is the great church of St. Cuthbert, at Durham; occupying a position which no other English cathedral can rival.

From the great natural advantages of its situation, and from the remarkable events which led to its being there placed, Durham may be called the most romantic of our cathedrals. None other can afford such a variety of prospects; it is literally a church amongst woods, rocks, and water, and the view of it from the north side is the only one that in any way resembles that obtained of most of our great churches.

It is equally fortunate from a historical point of view, as the whole story of its rise and development has been recorded in a series of chronicles which have been preserved. Symeon and Reginald, in the twelfth century, Geoffrey of Coldingham, Robert de Graystanes, and William de Chambre in later times, have given us complete accounts of what was done through the Middle Ages. These are supplemented by various account rolls of expenditure during the fifteenth and sixteenth centuries, while the list is closed with "The Rites of Durham," a work written by one who had known the Abbey before its dissolution, and which gives accounts, not only of the arrangements of the buildings, but also of the varied ritual and the services of the church, its stained glass and monuments, and also of the offices and domestic economy of the house.

The rise of Durham was brought about by the departure of the congregation of St. Cuthbert from the Island of Lindisfarne owing to the Scandinavian ravages of the ninth century, and the posssession by the community of the incorruptible body of St. Cuthbert, which enabled them to survive those troublous times, and after various wanderings to establish themselves on the site of Durham which is so strongly defended by nature itself.

The settlement of the "congregation" at Durham occurred in the year 995 during the episcopate of Aldhune. A wooden church was erected at first, but this was soon replaced by a stone building, which, at the time of Aldhune's death, in 1018, was almost complete. Reginald gives some description of it. It was called the "White Church," and it seems to have had two stone towers, a western and a central one, both with spires of metal. Reginald's eulogistic words as to the beauty of this building leave us nothing on which to ground a supposition as to its size, but the two towers imply a church of upwards of 200 ft. in length. The present church occupies the same site, and there are no remains of its predecessor; it has entirely disappeared.†

The existing cathedral was begun by the seventh Bishop of Durham, William of St. Carileph, in 1093. The foundation stone was laid on August 11, in that year, Aldhune's church having been previously destroyed. Thus the usual course of building, at any rate, a part of the new church, before removing the old one, was departed from. We are not told what the people used for a church between times, but the extreme rapidity with which the building was executed seems to confirm Symeon's account of the mode of procedure.

Carileph's plan comprised a choir of four bays, with an apsidal eastern termination; transepts of four bays to the north and the south, with an eastern aisle only; and a nave of eight bays, with two aisles and two western towers, which project somewhat beyond the line of the aisles. A central tower was also intended.

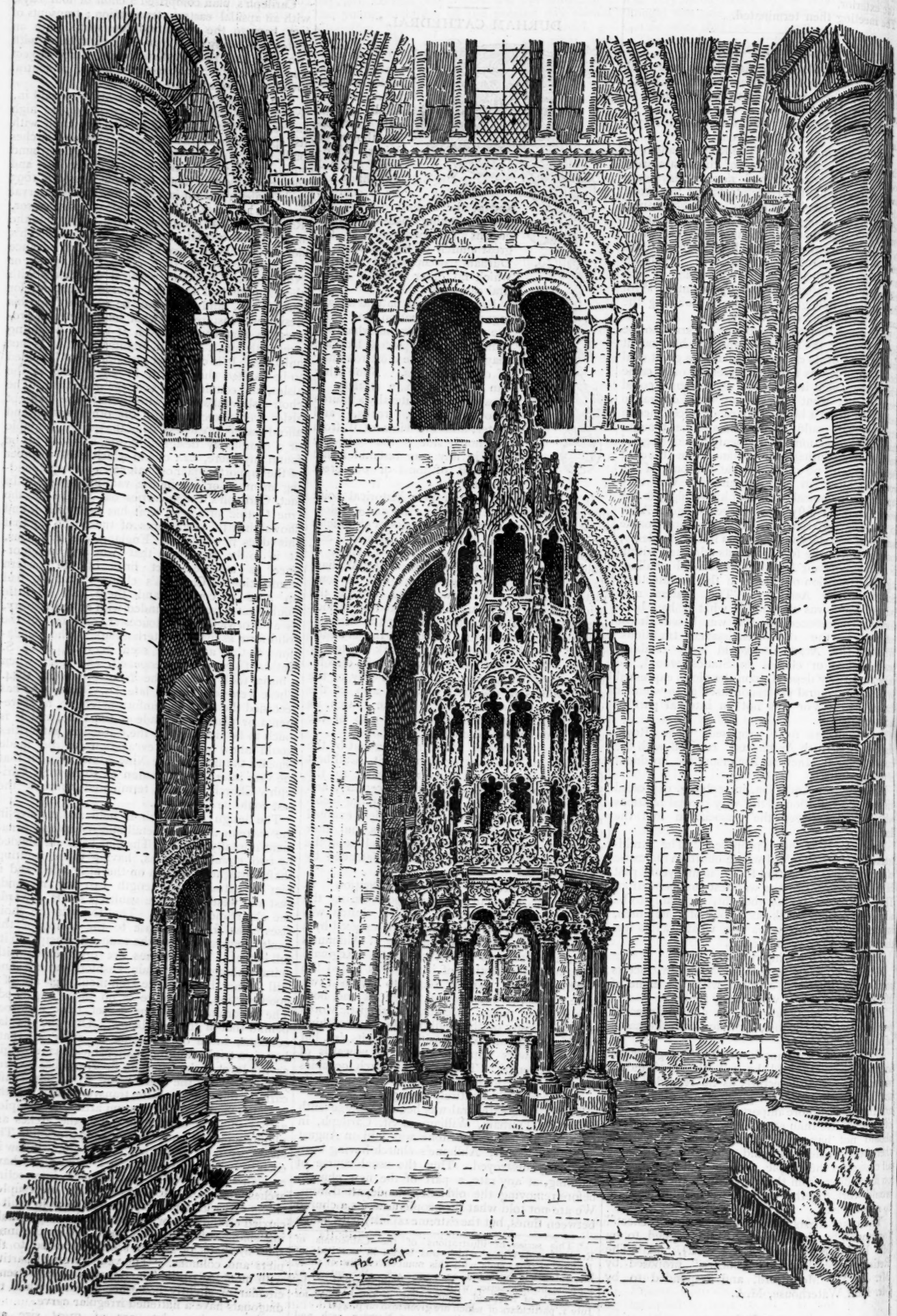
The foundations of all this work were laid in, the walls all round the church carried up as high as the top of the aisle wall arcade, the choir with its apse finished, the crossing piers and arches built, along with two bays of the nave in the ground story, one bay of the triforium on either side, and the greater part of both transepts, between 1093 and Carileph's death in 1096; and in the interval between his death and the election of his successor, Ralph Flambard in 1099, during which time the monks had carried on the work. Carileph's design was one of great ambition, and in advance of anything of his time either in England or Normandy. Owing to political differences with the king he had been an exile in Normandy for three years, and there can be no doubt that his design was inspired by what he had seen in progress in that country, even if he did not bring over with him a Norman architect, which is not unlikely. It is clear that his church was intended to be vaulted throughout, in single bays in the aisles, and coupled bays over the main area. The choir aisle vaults along with those to the transept aisles were executed with the other work, and afford one of the earliest, if not the earliest, example of a completely designed Norman vault to be found anywhere, *i.e.*, one in which each member of the supporting pier or shaft carries a corresponding member or rib in the vaulting system. In fact, Carileph's design carries out to the full the true Gothic principle, as it has been called, and shows that the arguments of those who say that this does not exist in England are fallacious, It is to be regretted that we are in ignorance as to the exact lines of the eastern termination of Carileph's choir. That it had an apse is certain, and there can be little doubt that it was surrounded with an ambulatory, as at Norwich and Gloucester, and not of the solid form as that of Peterborough. The foundations of this apse were seen in 1827, when S. Cuthbert's grave was reopened, and again when a burial took place in the Nine Altars in 1844. These were seen by the late Dr. Raine, who has recorded the facts, but unfortunately no measurements or plans were made at the time, and it is much to be desired that the Cathedral authorities would allow a slight excavation to be made beneath the floor of the Nine Altars in order that the very interesting question as to how St. Carileph's Church actually terminated towards the east could be set at rest.

The design of the choir is bold and massive in the extreme; all fine detail and redundant ornament is totally absent. The four bays are divided by two circular columns, having triple vaulting shafts attached to them on the aisle side; and a pier of extraordinary length carrying responds east and west, and triple vaulting shafts towards the choir and the aisle. That towards the choir rises clear from the base to the spring of the vault, thus carrying out the vaulting principle to its full extent. The columns are ornamented with spiral sinkings, have plain cushion capitals and still plainer bases. The arch mouldings are of a good section, but there is no projecting hood. The triforium wall-plane is set back one foot behind that of the wall below. Over the circular columns, or in other words to every alternate bay, is a triple vaulting shaft, which has its origin as the level of the triforium floor, and has no projection beyond the wall below it. These shafts carried the intermediate transverse ribs of the Norman vault. The triforium arcade has coupled arches under a containing arch, the arches are plainly moulded, and the tympana are solid. The clearstory is of ample height, has one window in each bay, but no wall passage. The aisles have a wall arcade with semi-circular intersecting arches of plain mouldings resting on coupled shafts with cushioned capitals. The aisle vault is carried on the wall or outer side, by triple vaulting shafts rising from the floor, and on the inner side by shafts of similar section attached to the piers and columns. The vault is quadripartite, with moulded ribs. The transverse ribs are semi-circular or slightly horseshoe in form, while the diagonals have a flattened irregular curve.

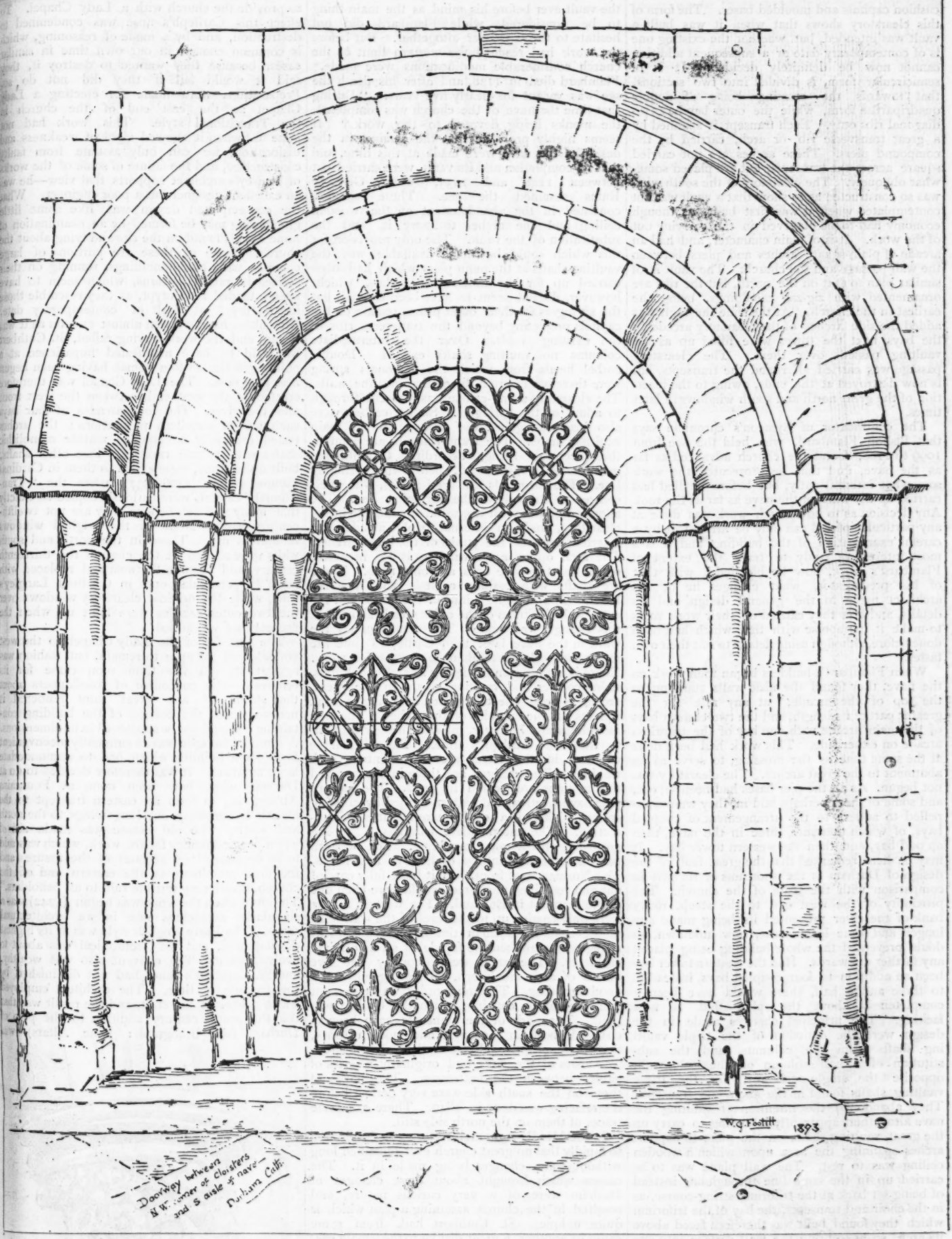
The crossing piers are of great size and solidity, and so well built that they have stood without buttressing or any subordinate supports, and they and the arches they carry show no signs of shrinking, though they bear aloft a tower

* This series of illustrations of the Cathedrals of England and Wales, which was begun in our issue of January 3, 1891, ends with this number. A list of those illustrated will be found on page 438. We intend to supplement this series with another, illustrative of the Cathedrals of Scotland, commencing in the number for July 1, particulars of which are given also on p. 438.

† Billings says there "are some Norman arch and column mouldings of earlier date than the present church" in the floor of a passage in one of the western towers. These are now covered with cement. A curious capital which may have belonged to the early church was found in the "College" some few years ago. This has now disappeared.



Durham Cathedral: View across West End of Nave.



216 ft. 8 in. in height, the highest central tower in England, Lincoln only excepted.

The chief peculiarity in the plan of the transepts is the narrowing of the space between the columns as they recede from the crossing in either direction. The intercolumniation of the two extreme bays is reduced to half that of the bays nearest the crossing. The reason of this setting out was to give an exaggerated perspective effect to the view of the transepts from the crossing. Our readers will be aware that the arrangements of the choirs of the Norman churches were made so that the stalls were placed beneath the crossing. Those seated in them looked down the transepts, and it was to give the utmost effect to this view that the arches were so spaced as to render the transepts of greater apparent length than they actually are. The same thing was sometimes done by making the walls of a church converge towards the east. Those tricks, however, were not commonly resorted to by Mediæval architects. The general design of the transepts (see lithograph illustration) is identical with that of the choir, except in the clearstory. The triforium occurs only on the eastern side, and has to accommodate itself to the spacing of the arches below. In the two extreme bays the triforium consists of a single arch only. The triple vaulting shafts found in the choir have become couples, and in the extreme bays these rise to the vault surface, which they seem to penetrate. As the two outer bays in each transept are spanned by a single quadripartite vault, the intermediate shafts are therefore useless, and were only inserted to preserve as far as possible the continuity of the design. The west side of the transept has arches opening into the nave aisles of the time of Carileph, a large window in each wing beyond the nave aisles, and above, at the triforium level, a wall passage, the openings to which are of various forms, and present some peculiarities.

The clearstory is of different designs in the two wings. On the north it has a triple arcade to each bay, the centre opening being opposite the windows. This arcade has single shafts with

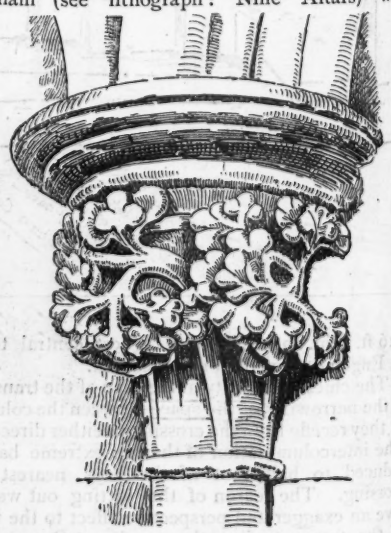
cushion capitals and moulded bases. The form of this clearstory shows that when it was built a vault was intended, but whether the existing one is of contemporary date or a subsequent addition cannot now be definitely decided. It is of semicircular form, is divided into two sections, that towards the crossing being of double quadripartite form, while the outer bay has two diagonal ribs only. Each transept is spanned by a great transverse rib or arch, carried by the compound piers. These arches are not carried square across the transepts, but are placed somewhat obliquely. The clearstory of the south wing was so constructed as to show that a vault was not contemplated when it was first built, as though economy had to be observed in the carrying out of the work. It is of plain character, and had an arcade of plain square arches and piers between the wall passage and the church. The vault is of similar plan to that on the north, but the ribs are ornamented with zig-zag mouldings, being the earliest in the church. At the time the vault was added the side arches of the clearstory arcade in the bays next the tower were filled up as the vaulting passed over them. The clearstory passage was carried all round the transepts, but is now destroyed at the ends, owing to the insertion of the great north and south windows in later times.

The continuator of Symeon's chronicle says that Bishop Flambard, who held the see from 1099 to 1128, found the church advanced as far as the nave, and that he prosecuted the work somewhat intermittently, but before he died had carried up the walls of the nave as far as the roof. Any decision as to how much work was done at any particular period can only be arrived at by a careful examination of the building, and it is a most interesting study to trace the extent of Flambard's work, how he blended it with that of his predecessor, what changes he or his architect made in the general design and its details, and how they carried on their work so as to make it harmonise with that which had been done before, although using details to suit their own tastes.

When Flambard's builders began their work on the nave, they found the aisle walls standing to the top of the arcade,* at any rate for the greater part of its length, and the two eastern bays of the main arcade with one bay of the triforium arcade on either side. This work had been done at the same time as the crossing, to serve as an abutment to the great arches. The clearstory was not begun. As all the pier bases had been set out, and some of them perhaps laid in, they were compelled to adhere to the arrangement of coupled bays, of which there are three in the nave, then an odd bay, and then the western tower bay. It may be here remarked that the great fault of the design of Durham is the shortness of its nave in comparison with the scale of the church. The proximity of the west end to the steep, rocky bank of the river prevented its being made any longer, and some local cause, now unknown, no doubt prevented the whole building being placed any further eastwards. Had the western tower bay been an addition to four coupled bays, instead of to three and a half, there would have been a completeness about the plan that is now lacking. The principal changes made in the design were the omission of the triple vaulting shafts from the columns, and the substitution of a half column on the aisle wall, opposite the single columns, for the triple vaulting shafts found in the choir and transepts. They abandoned the intention of vaulting the nave altogether, apparently intending to carry up the great vaulting shafts on the piers to support arches spanning the area upon which a wooden ceiling was to rest. The wall plane was to be carried up in the same line throughout, instead of being set back at the triforium string-course, as in the choir and transepts, the bay of the triforium which they found built was therefore faced above its arch, so as to bring the wall surface into one plane. The triforium vaulting shafts over the columns found in the choir and transepts were omitted, as with the modified design they were not required. The clearstory has a wall passage, and the external wall was made similar to that in the transepts, but internally large plain arches of 14 ft. span seem to have been formed as an arcade towards the church. Such was Flambard's design for the nave. It was a bold conception, but was a much more economical plan than that of his predecessor, who kept the requirements of the vault ever before his mind as the main thing to be considered, while Flambard did not hesitate to throw it over altogether. But before the work had reached the western limit of the church considerable modifications were made.* Flambard died in 1128, and after his death the see was vacant for nearly five years. "During that time the nave of the church was completed, the monks being devoted to the work.† It seems highly probable that the changes in the design of the nave were made at this time, and that its completion and its vault were carried out between 1128 and 1133, when Geoffrey Rufus assumed the see. These changes consisted in the abandonment of the wooden ceiling and the arches to carry it, and the substitution of the vault. The only provision for this which could be made available was the vaulting shafts at the main piers which had been carried up for the transeverse arches, which, however, do not seem to have been erected, but the springers for their outer orders remain on the capitals projecting beyond the transverse ribs of the existing vault. Over the intermediate columns no vaulting shafts existed. Double corbel heads from which the diagonals spring were therefore inserted, by cutting into the walls. The clearstory string-course was also cut through to admit of the springers. Similar corbels were also inserted against the capitals on the main vaulting shafts. The transverse ribs are pointed, their centres being, according to Billings's measurements, about 3 ft. below the springing line. The diagonals are semi-circles, with their centres a little above the springing line. The adoption of the vault necessitated a change in the clearstory, and an internal triple arcade was inserted between the jambs of the larger arches. The arch opposite the windows is 6 ft. in width, while the two side ones are only 18 in. There are shafts with cushion capitals and moulded bases. The straight joints in the jambs and the extra wall thickness of the older arcade show that this change was made. The details of all the work in the nave later than Carileph's time are much more elaborate than in the earlier work. There is a profusion of zig-zag in arch-mouldings, string-courses and vaulting ribs. In the great arcade a good effect is gained by a ring of sunk squares on the extrados of the arches. The arch mouldings are, however, inferior in their sections to these of Carileph's time. The six single columns in the nave are ornamented with sinkings. The designs are three in number and the columns are treated in pairs. The eastern pair have a reticulated pattern formed by crossing spirals. There is a small square left at each intersection. The intermediate pair has a zig-zag grooving with a good moulding. The western pair has vertical flutings of hollows and beads. The Norman west front, had it been fully carried out and remained unaltered, would have been one of the grandest in England. The western towers were only carried up to the level of the wall-head of the nave in Norman times, and subsequent changes have robbed the façade of all its original character. The great west doorway had five orders of arch mouldings, all zig-zagged, and a hood moulding. The inner order was taken out and the jambs cut into when the Galilee was built. The ends of the transepts have been so changed, both in Mediæval and modern times, that their original character has disappeared. The aisles of the nave had originally a series of gables between the buttresses. The marks of these on the south side were very perfect before the refacing was done in 1849. There are some traces of them on the north side still.

In the Middle Ages architecture was developing so rapidly that no great church ever remained long without some changes being made in it. The causes which brought about these changes at Durham were of a very curious nature, and resulted in the church assuming a plan which is quite unique. St. Cuthbert had, from some cause or another, a great dislike to the female sex, which he carried so far that he could not treat the Blessed Virgin with that honour which was usual in his time. The successors in his see seem, however, to have carried this craze still further on behalf of their Saint than he himself ever contemplated, and to have made a handle of it to provide their own schemes. In the time of Hugh Pudsey, one of Durham's most conspicuous bishops (1153-1195), there was a scheme on foot to provide the church with a Lady Chapel. To effect this Carileph's apse was condemned to destruction, and by a mode of reasoning, which is common enough in our own time in similar cases, because they wanted to destroy it, they said it would fall if they did not do so. Preparations were made for erecting a Lady Chapel at the east end of the church in the Transitional style. This work had not gone far when it showed signs of weakness and dislocation, we can only assume from faulty construction, and the failure of some of the works of Pudsey's architect supports that view—he was an excellent designer but a poor engineer. What the contemplated design was like some little glimmering may be formed by an examination of some details found on the site and lying about the church. Some of these are portions of large columns with bold mouldings, running on their surface in raised patterns, which seem to have been intended for a crypt, as they resemble those in the crypt at York of contemporary date. Difficulties having arisen almost as soon as it was begun, and the work having failed, St. Cuthbert was said to have manifested impatience at a building dedicated to a woman having been begun near his grave. The Lady Chapel was therefore erected at the west end, between the west front and the river. The four arcades of four bays each are of excellent proportions; the arches rested originally on coupled marble monolithic shafts with volutic capitals. Two other shafts, built up in stone, were added to them in Cardinal Langley's time (1406-1437), when the "Transitional" capitals were curiously copied so exactly that many will not believe they are not twelfth-century work. None of the original windows remain in use. Those in the north and south walls were altered at the close of the thirteenth century, and those in the west end replaced with large Perpendicular ones in Cardinal Langley's time, while the original clearstory windows over the two outer arcades were built up when the present roof was added.

The transfer of the Lady Chapel to the west end allowed the apse to remain, but fashion was against it, and the time soon came for its removal. The concourse of worshippers about the shrine of any great saint rendered it necessary that the portion of the building containing it should not be straitened in its dimensions. A semicircular apse was an eminently inconvenient form for a building which had to accommodate large numbers. It was therefore decided to do at Durham what had been done at Fountains Abbey, viz., to form an eastern transept to the church by throwing out long wings to the north and south. The old excuse was made use of when begging money for the work, which was said to be necessary "on account of the fissures and fractures prominent at the eastern end of the church, threatening terrible ruin to all beholders." The time when the work was begun (1242) was a singularly auspicious one in an architectural sense. The Early English style was at its highest development, and the Geometrical was about to evolve from it. The convent also was wealthy, and St. Cuthbert's fame had not diminished by the passage of time. The architect employed was a master of his craft, and the result was that the thirteenth-century addition to the plan of Durham (see lithograph: Nine Altars) was



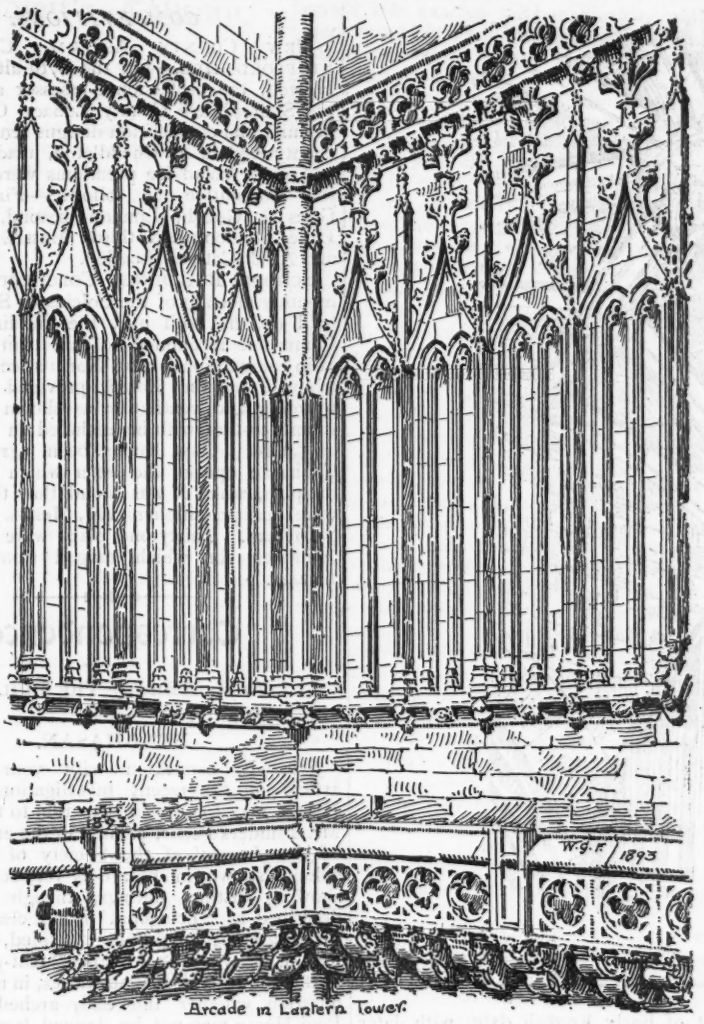
Capital: Nine Altars.

a masterpiece in all senses. Judges competent to give an opinion, both from knowledge and taste, have pronounced it to be the best specimen of Early English to be found. It is

* This is proved by the different colour of the stone above and below the arcade, and by the weathering of the surface caused by the work standing exposed for a few years, as well as by certain chippings and injuries along what was the top course. Some of these could not have occurred if the wall had all gone up at one time.

* "Symeon's Continuator" says: "As to the works of the church he prosecuted them at one time with energy, at another time tardily; as money was plentiful or scarce with him, from the offerings at the altar or in the cemetery. From these sources he carried up the walls of the nave as far as the roof." Changes in the design was not an improbable result from such a mode of obtaining funds.

† "Symeon's Continuator."



Arcade in Lantern Tower.

magnificently built. Though its walls rise straight from the ground, they have borne up its lofty vault for more than six centuries without the least sign of settlement or flaw, though unaided by arcades, aisles, or flying buttresses. The great thrust of the heavy ribs is taken by the enormous thickness of the walls, nearly 8 ft., and by the huge piers at the angles forming buttresses and carrying pinnacles. The details throughout are most carefully designed and beautifully wrought.

Arcading: Nine Altars.

Arches, capitals, vaulting ribs and bosses are all liberally supplied with carving, all of it of the best class, yet so great is the scale of the building that there is no appearance of undue richness. A great point was made by lowering the floor to that of the level of the falling ground to the east, instead of by raising the building on a crypt. This has given an internal height of 80 ft., considerably exceeding that of the choir or nave. Against the east wall nine altars were placed. There are doorways at either end, placed to the west of the steps to the altars. These doorways were no doubt used by pilgrims and others who would be accommodated in the main area of the building to view the shrine, which was placed on a platform on the level of the choir floor and projected into the Nine Altars.

It is extremely interesting to be able to say that both the names of both the architect and the master mason of the Nine Altars have come down to us. The name of the former occurs in a deed conveying land in the Bailey as "*Magister Ricardus de Farinham tunc architector novæ fabricæ Dunelm.*" That of the latter is cut on the north and east sides of the plinth of south great buttress on the east side of the Nine Altars and is here given.

The only subsequent extensions of the church, as far as the plan is concerned, were the north porch, added in the Early English period and destroyed in 1780, and the Revestry on the south side of the choir, a very considerable building with curious chambers at its western end. It was built about 1300 and destroyed in 1802 to make way for some heating apparatus which, however, proved a failure. Its windows were all filled with fine ancient glass which has perished with the other curiosities of that interesting building. The Sacrist's exchequer was added in the time of Prior Wessington (1416-1446), and stood in the angle of the north choir aisle and north transept. It was removed in time of Charles I.

The western towers were carried up in the early years of the thirteenth century. They were crowned by lofty octagonal timber spires covered with lead. These survived till the time of the great rebellion. The present battlements were added about 1780.

The central tower does not seem to have been built in Norman times. Had it been it would probably have survived as there has been no failure in the piers, such as has caused the destruction of so many Norman central towers in both ancient and modern times. An Early English tower existed, which had, no doubt a lofty leaden and timber spire for it was destroyed by fire after being struck by lightening in 1429. The present fine tower was begun about 1464 and was unfinished in 1474. It was intended to carry a spire as there are massive squinches in the angles, and there can be no doubt that both piers and tower would have successfully borne the extra load.

The changes made in the Norman church during the Middle Ages, beyond those enumerated, were the insertion of larger windows and the addition of furniture and tombs.

The great window at the north end of the Nine Altars is not an insertion but was erected with the work in which it is placed, though the original design was for a series of lancets as at the south end. The Nine Altars was begun in 1242 but was not finished till about 1280, and as the north end was the last portion executed the work extended into the Geometrical period.

In the time of Prior Fosser (1331-1374), the great west window and the north transept window were inserted. Prior Wessington (1416-1446), added the south transept window and the new rose window at the east end, destroyed in 1780. An Early English rose existed as is shown by the scoinsen arch of that date still remaining. The aisle windows of the choir were insertions of the fourteenth century. Those on the south side have been renewed according to the old designs, those on the north side were most stupidly destroyed and copies of others in Kent and Lincolnshire substituted. Carter's and Billings's plates show the former ones.

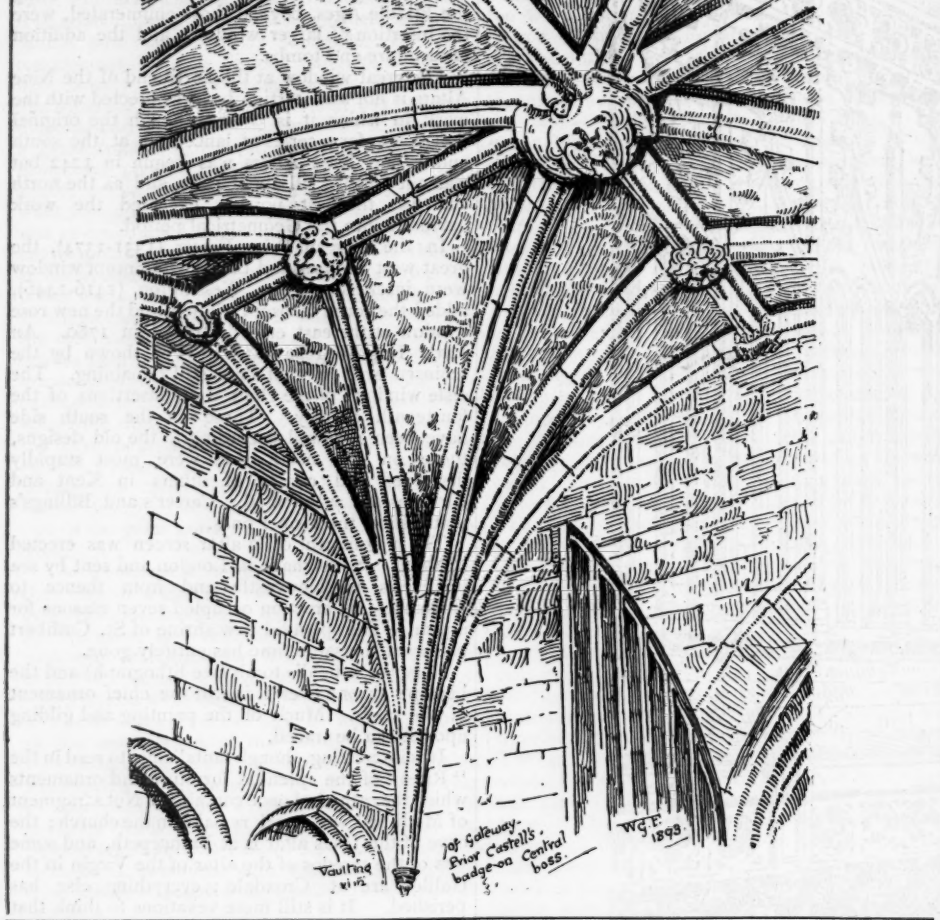
The magnificent open altar screen was erected in 1372. It was made in London and sent by sea in chests to Newcastle and from thence to Durham. Its erection occupied seven masons for a year. The splendid new shrine of St. Cuthbert put up at the same time has entirely gone.

Bishop Hatfield's tomb (see lithograph) and the bishop's throne over it is still the chief ornament of the choir. Much of the painting and gilding upon it can be traced.

It is interesting, though tantalizing, to read in the "Rites" of the splendid furniture and ornaments which the cathedral once contained. Not a fragment of Mediæval woodwork remains in the church; the cove of the Jesus altar is at Brancepeth, and some bits of the reredos of the altar of the Virgin in the Galilee are at Croxdale; everything else has perished. It is still more vexatious to think that the very fine Marian and Jacobæan furniture and screens which replaced the older work has been to a great extent destroyed or removed quite recently—*e.g.*, the beautiful screen of St. Cuthbert's shrine in 1844, and the clock-case, which contained a good deal of Mediæval work of the time of Prior Castell in 1845. The font cover escaped by being put into a corner as inconvenient to remove, and has been reinstated. Of the three splendid brass chandeliers which served to light the choir, two were recovered by the action of Canon Greenwell, after having been thrown out as lumber and sold. The third, the large central one, was used at Ryton Church for a time, "then sold to a music-hall in Newcastle, and ultimately melted." The account of the havoc and destruction wrought at Durham since the blight of

The Sanctuary Knocker.

"restoration" fell upon it would require a book to itself. Only a few things can be mentioned here. One of the most deplorable was the destruction of all the traceried windows in the nave and transepts, except the great end windows



and those which have fortunately escaped in the north transept, and the substitution of imitation Norman. In like manner the amount of ancient stained glass which has perished during the same period is almost incredible. In 1849, on the

destruction of the windows in the Nevill chapel, the stained glass in them, which many remember, perished too.

Our survey of the monastic buildings must be a brief one. Next the south transept is the slype, apparently contemporary with the transept. It has a good wall arcade of intersecting semicircular arches. The Chapter House was of two dates, and was not completed till about 1140. Its apsidal end had had traceried windows inserted in the fourteenth century. This portion was destroyed in 1796 along with the vault over the whole. The west walls remained, and the side walls in part. Carter's drawings preserved a record of it, and it is now being rebuilt more or less on the old lines. Beyond the Chapter House are some early walls of the time of Walcher, the first Norman bishop. Then an early crypt, with a double-barrel vault, carried by an arcade on square pillars. South of the cloister is a long Early Norman crypt, and various chambers connected with the domestic economy of the house. Above this was the Frater House, now the old library, which has been twice modernised. The west side is occupied by a long vaulted crypt of Early English date, with later insertions and additions. A portion of Norman walling has survived on the west side of it. Above is the new dormitory, a magnificent room of the fifteenth century, with two tiers of windows and a grand open timber roof, which only escaped destruction in 1850 by the architect employed boldly refusing to do the evil work.

The kitchen is an octagon with a fine vault, and dates from 1368.

The cloister was rebuilt in the time of Bishop Skirlaugh (1388-1405), but all the windows were replaced by the existing ones about 1773. The bason of the old lavatory still lies in the centre of the garth.

The Priory is of various dates, and contains a good chapel of Early English, with a vaulted undercroft. The Chapel itself is turned into modern bedrooms. There is also an entrance hall of Prior Castell's time (1494-1519), with a traceried south window and good ancient panelling. One of the bedrooms has a fine ceiling of Mediæval woodwork.

The Abbey gate, to the south-east of the Priory, is also of Castell's time, and has a good vault.

The curious buildings to the west of the new dormitory have recently been excavated and opened out under the direction of Canon Greenwell. They contained the latrines and the great prison. Their connexions with the dormitory and also the cellarer's exchequer were destroyed not many years ago. They may be understood by a reference to Carter's plan.

The plan is taken through the church at the level of the aisle windows, and through the other buildings at the ground level, but the Chapter House and kitchen are taken at a higher level to show some features which do not appear on existing plans. The Priory is drawn in as well as other buildings from special surveys previously unpublished. In the church the destroyed Mediæval windows are shown in preference to the imitation Norman ones, and the stalls are drawn in from Billings's plan. C. C. HODGES.

BUSINESS CHANGE.—Messrs. John H. Hackworth & Company, of 46, Queen Victoria-street, inform us that they have succeeded to the business of the Machinery and Hardware Company, Limited.

THE ACME WOOD FLOORING CO.—The secretary of this company asks us to mention that there is no connexion between it and the firm of Duffy & Son, which has recently gone into liquidation. The point of the announcement lies in the fact that the Acme flooring system is also known as "W. Duffy's Patent."

COMPETITIONS.

NEW COUNTY ASYLUM, CHEDDLETON, STAFFORDSHIRE.—On the 27th ult., Mr. C. H. Howell, the professional assessor appointed by the Staffordshire County Lunacy Committee to examine the competition designs sent in for a new county asylum at Cheddleton, made his report, and under his advice premiums were awarded by the Committee as follows:—First, Messrs. Giles & Gough, London; second, Mr. G. T. Hine, London; and third, Messrs. J. G. Izard and A. B. Cottam, London.

SCHOOL BUILDINGS, COLCHESTER.—At the monthly meeting of the Colchester School Board, held on the 26th ult., the Building and Sites Committee recommended that plan No. 16 sent in in competition for the North-street Schools be adopted by the Board, provided the cost of warming and ventilation as shown by the plan submitted therewith be included in the estimate of 5,260*l.* This having been agreed to, the Chairman opened the letter which accompanied the plan, when it was found that the architects were local practitioners, viz., Messrs. J. F. Goodey & Cressall. Thirty-one plans were sent in, the estimates for which ranged from 3,300*l.* to 14,244*l.*

Correspondence.

To the Editor of THE BUILDER.

BENI-HASAN.

SIR,—In connexion with your interesting article on the recent investigations at Beni-Hasan, may I call your attention to the paper by Mr. Flinders Petrie, printed in the enclosed issue of the *Journal* of the Society of Arts. The column shown in Fig. 8 is very remarkable, as showing distinct flutings, though why it is described as "octagonal" is not clear; from the illustration it might be 16 sided, or circular. Fig. 9, showing the probable "tent-pole" origin of the bell-topped column, raises, in my mind, the question whether the early arched ceilings at Beni-Hasan may not be derived from tents, and not from brick structures. The use of the arch-topped representation of a booth, as the hieroglyph for a festival, shows the persistence of the form. R. LANGTON COLE.

*** The drawing of a column referred to by Mr. Cole is one of the 16-sided columns, wrongly described in the *Journal* of the Society of Arts as "an eight-sided column." The effect of the fluting is probably very much exaggerated in the shading, and a large-scale plan of the column would probably give a very different impression. In regard to the arched ceilings of Beni-Hasan being derived from tents, it should be remembered that the top of a tent would show a convex curve when viewed from the interior, not a concave one.—ED.

THE BELASYSE MONUMENT.

SIR,—In the *Builder* of September 9, 1892, appeared an interesting "Note" on that ardent Royalist soldier, Lord Belasyse, who died on September 10, 1689, and was buried in the Church of St. Giles's-in-the-Fields. The "Note" in question commenced with the following sentence:—"The Society for Preserving the Memorials of the Dead have, as we understand, undertaken to repair the Belasyse monument, against the east wall of St. Giles's-in-the-Fields Church."

A few days ago I went to have a look at the "repaired" monument, and found that a hoarding had been erected round it, and through the cracks in the boards I could see parts of the monument lying on the ground and the main portion of the structure shored up with props. I understood that it had been in this state for about twelve months, and during that time the interior of the hoarding appears to have formed a handy receptacle for various items of discarded rubbish.

In view of these facts, I for one should be very glad to know if the Society in question does really intend eventually to repair the monument. They have already done good work near the spot by repairing the monuments of Richard Penderell and George Chapman, and for many reasons it is much to be hoped that the monument of Lord Belasyse will not be forgotten until the ravages of time have rendered the idea of repair impossible.

ROYALIST.

A COUNTY COUNCILS' RIVER MAP.—A map, published by J. E. Cornish, Manchester, of the river basins of England and Wales, defines the natural jurisdiction of Joint Committees of County Councils for the prevention of pollution of rivers under section 14 (iii.) of the Local Government Act of 1888. The limits of each watershed are distinguished by red shaded boundary lines.

The Student's Column.

CHEMISTRY.—XXII.

COMPOUNDS OF LEAD (*continued*).

RED LEAD is a red oxide of lead, Pb_3O_4, prepared by exposing litharge, a monoxide of lead, to a dull red heat in a current of air. It is usually regarded as a compound of monoxide and dioxide of lead, thus, $2PbO + PbO_2 = Pb_3O_4$. If red lead is acted upon by dilute nitric acid, the monoxide is dissolved, and forms lead nitrate, while the dioxide is left as a brown powder.

Red lead is used as a "drier," also for painting iron, and as a priming coat for wood. It is sometimes known as *minium*. Red lead is sometimes adulterated with red brick-dust, but this is readily detected by an analysis, which may be made in the same manner as the analysis of white lead (see experiments, group 12), with the exception that when dissolving the material in dilute HNO_3, a lump of sugar or some other oxygen-extracting substance should be added in order to reduce the PbO_2, which is insoluble in HNO_3 into PbO. A sample of red lead in the form of a dry powder yielded 131·2 per cent. $PbSO_4$. $131{\cdot}2 \times {\cdot}7534 = 98{\cdot}84$. per cent. Pb_3O_4. It is said that red lead is sometimes adulterated with red oxide of iron. This adulterant may be detected by the following process:—Boil some of the red lead with HCl, cool the solution and filter. In order not to have a very strongly acid solution, add ammonia, but be careful to keep the solution distinctly acid. Then pass H_2S gas through this acid solution until no further precipitation of black lead sulphide is produced. Finally, filter, and to the clear filtrate add excess of ammonia and ammonium sulphide. If any iron salt was present, a black precipitate of iron sulphide will now be produced.

Lead monoxide, *massicot*, or *litharge*, PbO, is obtained as a straw-coloured powder by heating metallic lead in air at a moderate heat, or as a reddish powder by employing a higher temperature. It is used for the manufacture of lead or flint glass, and for the preparation of red lead.

Lead dioxide, *puce oxide*, or *brown oxide*, PbO_2, is obtained by treating red lead with nitric acid.

Lead sulphide, PbS, is found native as galena.

Lead acetate, or *sugar of lead*, $Pb(C_2H_3O_2)_2$, sometimes written PbA_2, is prepared on a large scale by dissolving litharge in acetic acid. It is sold in a white crystalline form, and has a sweetish taste. Like all the soluble lead salts, it is very poisonous. It is largely used as "driers" for paint.

Lead chloride, $PbCl_2$, *lead sulphate*, $PbSO_4$, and the other lead salts, are not of much commercial importance. An insoluble lead chromate, $PbCrO_4$, is sometimes used as a pigment under the name of chrome yellow.

Symbol Ag. *Silver.* *Atomic Weight* 108.

Silver is sometimes found in the free state, but is obtained in largest quantities from its ores. The most important silver ores are the sulphide, known as silver glance, Ag_2S, and the chloride, known as horn silver, AgCl. A considerable portion of the silver of commerce is obtained from galena by the methods described under Lead (see Paper XXI.). Silver rapidly tarnishes in air containing small quantities of sulphuretted hydrogen on account of the formation of silver sulphide, Ag_2S, which is a black compound. Pure silver is too soft to resist ordinary wear-and-tear well, and is therefore alloyed with copper. Electro-plate is produced by depositing a thin coating of silver upon articles made of baser metals by electrolysis. Silver is very ductile and extremely malleable, and is one of the best conductors of heat and electricity. Silver readily dissolves in nitric acid to form nitrate of silver.

Silver nitrate, $AgNO_3$, is sometimes sold in the form of crystals, and sometimes is fused into sticks. It forms the *lunar caustic* of the surgeon. When exposed to light it stains organic substances to a black colour. It is used for making indelible marking ink, and for preparing silver chloride, silver iodide, and silver bromide, which are largely used in photography.

Symbol Hg. *Mercury.* *Atomic Weight* 200.

Mercury (Latin name, Hydrargyrum) is sometimes found in the free state, but is almost wholly obtained from cinnabar, a sulphide of mercury, HgS, which is found in Spain, California, China, &c.

The metal is easily obtained by simply roasting the ore in a current of air. The sulphur is converted into gaseous sulphur dioxide, while the mercury which is left in an uncombined condition volatilises, and the vapour is condensed in brick chambers or clay tubes.

Mercury or "quicksilver" is the only metal which is liquid at ordinary atmospheric temperatures; it is not affected by hydrochloric acid, but dilute nitric acid dissolves it readily, and it is also attacked by strong hot sulphuric acid. Mercury is used for artificially preparing *Vermilion*, a sulphide of mercury, also for barometers and thermometers, and for "silvering" looking-glasses. All the common metals, except iron and platinum, readily form alloys with mercury, such alloys being termed *amalgams*. If a gold ring is brought into contact with mercury, it instantly assumes a silvery colour, and after a time becomes so brittle that it is easily broken.

Mercurous Chloride, or *Calomel*, Hg_2Cl_2, is a whitish powder insoluble in water, which may be prepared by heating a mixture of corrosive sublimate and mercury.

Mercuric Chloride, or *Corrosive Sublimate*, is a very poisonous crystalline salt, which is soluble in water, and forms one of the most effective disinfectants. It is also much used for preserving the skins of birds and small animals. It is prepared by heating a mixture of mercuric sulphate and common salt with a little manganese dioxide. It distils over as a vapour, and is sublimed.

Mercuric Sulphide, HgS, is found native as cinnibar, but is also prepared artificially as a black precipitate by the action of sulphuretted hydrogen upon a solution of a mercuric salt. When this black sulphide is sublimed it changes to a red colour without altering its chemical composition, but is then known as *vermilion*. Vermilion is also sometimes prepared by a wet process, which consists in grinding sulphur and mercury together for several hours, and mixing the black sulphide thus formed with warm caustic potash solution. This latter process is said to produce a superior product.

Mercuric oxide, HgO, is a red, insoluble powder at ordinary atmospheric temperatures, but becomes black when subjected to a moderate heat. It regains its original colour upon cooling. When heated strongly, mercuric oxide is decomposed into oxygen and metallic mercury.

Symbol Cu. *Copper.* *Atomic Weight* 63·5.

Copper is found in the metallic state in many countries, being most abundant in Siberia and South America. The metal is, however, mostly obtained from its ores, the most important of which are the sulphides Cu_2S, CuS, and copper pyrites $CuFeS_2$. Among the less abundant ores are malachite, a carbonate of copper $CuCO_3 + CuH_2O_2$; red cuprous oxide, Cu_2O; and black cupric oxide, CuO. In Britain, copper ores are found in largest quantity in Cornwall, but are mostly smelted at Swansea.

In order to extract copper from copper pyrites, the ore is first roasted for about twelve hours. The sulphur in the ore is thus expelled as sulphur dioxide gas, while the arsenic which is usually present as an impurity is driven off in white fumes of arsenious oxide, and the iron is converted into iron oxide. The ore is then transferred to a reverberatory furnace and smelted with silica or some silicious compound. By this treatment a large proportion of the iron is converted into a fusible slag of silicate of iron, which is removed, while the so-called "coarse metal," consisting of sulphide of copper with a small proportion of iron sulphide, remains behind. This coarse metal or "mat" while still liquid is run into cold water in order to granulate it. It is then again roasted, and again smelted with silicious matter to remove the iron. "Fine metal," consisting almost entirely of copper sulphide, is thus obtained. The copper sulphide is then partially oxidised by roasting it in a current of air, in order to obtain a mixture of copper oxide and sulphide. Air is now excluded from the furnace, and the oxide and sulphide then react upon one another to form sulphur dioxide and metallic copper.

$$4CuO + 2CuS = 3Cu_2 + 2SO_2,$$

or

$$2Cu_2O + Cu_2S = 3Cu_2 + SO_2.$$

The metal thus obtained is very impure, but is refined by roasting it for some time to drive off traces of arsenic and sulphur, and oxidise other impurities. The metal now contains a small quantity of suboxide of copper, and to remove this it is covered with finely-powdered carbon while in a molten condition to prevent oxidation, and well stirred with a pole of green wood. The gases escaping from the green wood reduce the copper suboxide to metallic copper.

Copper is very malleable, but is inferior in tenacity to wrought iron. The tensile strength of cast copper is about 8½ tons per square inch, while that of copper wire is about 16 tons on the square inch. Copper is an excellent conductor of heat and electricity. When exposed to the atmosphere, copper gradually becomes coated with oxide and carbonate of copper. The latter is of a green colour, and is often called *verdigris*, but true *verdigris* is a basic acetate of copper. All soluble copper salts are poisonous, and when food is boiled in a vessel coated with copper oxide or carbonate it is liable to produce fatal effects. So long as the copper vessels are kept scrupulously clean no harm can accrue from their use—unless, of course, they are brought into contact with vinegar or other acid. Copper is largely employed for the manufacture of brass, bronze, and gun-metal. Copper is scarcely affected by dilute hydrochloric acid, but is soluble in hot concentrated sulphuric acid, and dissolves readily in nitric acid.

Copper Sulphate, $CuSO_4 + 5H_2O$, also known as *blue vitriol*, is the most important salt of copper. It crystallises in large blue crystals. It is largely used in calico-printing, electrotyping, and for the manufacture of Scheele's green, Brunswick green, and other pigments.

Symbol Au. *Gold.* *Atomic Weight* 196.

Gold is always found in the metallic state, and is always found associated with silver. Although it is only found in small quantities, it is very widely distributed. It is found in small particles in the alluvial deposits or sand of certain rivers, and sometimes in the quartz veins of rocks. Occasionally "nuggets" of the impure metal are found.

Gold is collected from the sand in which it occurs by washing it in a "cradle." The sand and soil are washed away while the heavier grains of gold remain behind. From quartz, gold is extracted by crushing the rock and shaking it with mercury. The mercury forms an amalgam with the gold, which is left behind when the powdered rock is washed. When this amalgam is heated, the mercury distils of, is condensed, and again utilised, while the gold remains in the retort.

Gold is very ductile, and is the most malleable metal known. It can be beaten into sheets having a thickness of only $\frac{1}{280000}$th of an inch. Gold is not attacked by any of the common acids singly, but dissolves when boiled in a mixture of hydrochloric and nitric acids termed "aqua regia." Aqua regia is made by mixing 2 parts concentrated HCl with 1 part concentrated HNO_3.

Gold Chloride, $AuCl_3$, is the most important gold compound. It is prepared by dissolving gold in aqua regia and evaporating the solution to dryness. It is much used for photographic purposes.

Purple of Cassius, which is used for painting on porcelain, and is also employed for imparting a beautiful red tint to glass while in a molten condition, is obtained when a solution of gold chloride is added to a mixture of stannous and stannic chloride solutions.

Symbol Pt. *Platinum.* *Atomic Weight* 194·5.

Platinum is a silver white metal which, like gold, is only found in the metallic state and in very small quantities. It is always found associated with other rare metals. Platinum is not dissolved by any common acid singly, but dissolves in aqua regia. It is very infusible, and may be repeatedly heated to redness without appreciably altering its weight or composition. Crucibles and other apparatus made of this metal are therefore much used in chemical laboratories. Platinum is also largely used for electrical purposes.

Lead, antimony, tin, zinc, and certain other metals readily form fusible alloys when heated with platinum. Heated platinum vessels should therefore never be brought into contact with such metals.

TRADE CATALOGUES.

MESSRS. RICHARD MORELAND & SON, of Old-street, send us a very useful illustrated catalogue of constructional work in steel, wrought-iron, and cast-iron. Girders, joists, stancheons, and columns are shown in various sections, and the dimensions and safe loads for varying spans and heights are given. Fireproof flooring and roof construction are also figured and described in the catalogue, which will undoubtedly be found very useful for reference.

Messrs. F. W. Reynolds & Co., of Acorn Works, Blackfriars-road, send us their new catalogue of wood-working machinery and builders' plant and appliances. It is well printed and illustrated, and the explanatory matter is clear and concise. The catalogue describes a great many hand and power machines which are models of compactness,

and machines, moreover, without which no builder's workshop of even moderate size can be said to be complete. As it is difficult to single out any for special mention, we advise builders to see the catalogue for themselves. They are sure to find in it something to suit them.

From Messrs. R. Waygood & Co., of Falmouth-road, S.E., we have received their new catalogue of hand-power lifts and hoisting machinery. The catalogue, which is well printed and illustrated, is very comprehensive and complete, and will enable the architect, the builder, or the building-owner to see at a glance the kind of lift suited to his requirements, whether a dinner-lift, a coal-lift, a carriage-lift, or a passenger-lift. The hospital and infirmary lifts shown on p. 10 of the catalogue appear to be very simple and efficient, and the invalid or passenger lift, shown on p. 11, worked by hand-power, is so arranged as as to enable an invalid to be moved in his *chaise roulante* along corridors and from floor to floor without disturbing him. Warehouse and cellar lifts of all kinds, worked by gas, steam, or electricity, are illustrated in the catalogue.

Mr. George Wragge, of Chapel-street, Salford, Manchester, sends us his "Supplementary Catalogue of Metal Casements and Opening Gear," which together with his previously-issued catalogue, affords a very useful guide to the specialties for which he lays himself out. The sections shown in the new book are new, and special rolls have been obtained for their production. It is claimed by Mr. Wragge that the new sections will render such casements absolutely wind and water-tight. After experimenting for a long period, Mr. Wragge says he has decided to use iron in preference to steel. He has his sections rolled of the best Staffordshire iron, which, he says, rusts a great deal less quickly than mild steel. For hanging the casements, he has abandoned brass hinges for steel pivots, with satisfactory results.

Messrs. Melhuish, Sons, & Co., of 84, Fetter-lane, E.C., sends us a large and comprehensive illustrated catalogue of tools and machines for wood-workers. In it, carpenters, joiners, cabinet-makers, and carvers will find enumerated a variety of tools suited to their use. The catalogue also includes tools for bricklayers, plasterers, moulders, and painters. The catalogue is worth perusal by the amateur as well as by the skilled craftsman.

The Crittall Manufacturing Company, Ltd., Braintree, send us their No. 2 catalogue of metal casements, sashes, and doors. It is illustrated with sections and details showing how metal casements can be provided for in cutting the stone mullions, transomes, &c. The catalogue will be found very useful.

The Edison and Swan United Electric Light Company, Ltd., send us their illustrated catalogue and price list of installation fittings, including lamp-holders, adapters, plug terminals, switches, switchboards, cut-outs, fuse-boards, ceiling roses, and many other details. A great deal of information about such things may be gleaned from the catalogue.

GENERAL BUILDING NEWS.

TECHNICAL SCHOOLS, HALIFAX.—The foundation-stone of the new Technical School at Halifax was laid on the 24th ult. by Mr. William Hunter, Master of the Clothworkers' Company of London. The site of the new building, which covers an acre of ground, is situated on the west side of the People's-park, and has frontages to Hopwood-lane and a new street called Francis-street. The main building will be three stories in height, and in outline will be L-shaped; the interior of the square being filled in by a one-story building, 135 ft. by 120 ft., which will be shed-lighted, and divided into various compartments to be used as workshops. The main entrance, which will be surmounted by a gable, will be placed in the centre of the Hopwood-lane façade, and will lead on to a main corridor, running the full length of the building. There are to be two other entrances from Francis-street leading into this corridor, and a fourth entrance, from Hopwood-lane, giving access to the lower floor. The basement floor will contain five class-rooms, lavatories, &c., and a caretaker's house: and the ground floor class-rooms, each 45 ft. square, chemical, lecture, and preparation rooms, staircases, and offices; while the first floor will be devoted to the Art School rooms, facing into Hopwood-lane, mechanical engineering class-rooms, a large lecture theatre, 66 ft. by 45 ft., retiring rooms, &c. The architects are Messrs. Jackson & Fox, Halifax; the clerk of the works is Hr. Henry Wilson; and the various contractors are—mason work, A. Foster; joinery, J. Fleming; slating, &c., Rushworth & Firth; plumbing, John Naylor & Sons; ironwork, John Berry, the various contracts amounting to about 13,000*l.*

ENLARGEMENT OF HOTEL, CULLERCOATS, NORTHUMBERLAND. — The Huddleston Hotel, Cullercoats, henceforth to be known as the Cullercoats Bay Hotel, has just been enlarged and altered. The new portion comprises the main entrance and three shops in the basement, with sitting and bedrooms on the first and second floors. The hotel proper occupies the whole of the premises except the basement, which is fitted up with bars, smoke-rooms, &c. Entering by the new doorway, and passing through a vestibule, laid with mosaic tiles, an oak staircase leads to the hotel. The accommodation consists of a large smoking and reading room overlooking the bay, buffet, and numerous conversation rooms, all facing seawards. A second-class bar, with a separate entrance in Huddleston-street, also has a large sitting-room attached. The general plan of the hotel is in the shape of the letter E, the three branches going from front to back of the premises. On the first floor is a large coffee-room and six private sitting-rooms with bay windows. The two end wings contain sitting and bedrooms, and the centre wing comprises the administrative department, with a banqueting hall capable of seating 120 persons, at the rear, reached by a separate staircase. On the second floor there are more bedrooms, and isolated from them, in the centre of the block, is the culinary department, with a complete service of lifts. There is also a billiard room. On each floor there are lavatories and bath-rooms. Behind the shops there is a room capable of seating 200 people, which it is proposed to utilise as a temperance refreshment department. The whole of the work has been designed by Messrs. Oliver & Leeson, architects, Newcastle. The contractor for the buildings was Mr. Joseph Elliot, J.P., of North Shields. The stoves and fireplaces were supplied by Messrs. Emley & Sons, Ltd., and Mr. H. Walker, of Newcastle, and the papering and decorations have been carried out by Mr. W. Taylor. The sanitary arrangements have been carried out under the supervision of Mr. J. McQueen, Sanitary Inspector to the Corporation of Tynemouth. Electric bells and speaking tubes are fitted throughout the building.

NEW STATIONERS' SCHOOL AT STROUD GREEN.—According to the *City Press*, plans for the new buildings have been accepted by the governing body of the school, but they await the decision of the Charity Commissioners. It is proposed to provide in the building accommodation for 250 scholars. Mr. G. Gordon Stanham, of Queen Victoria-street, is the architect. His design is for a Gothic building of red brick, with stone dressings, and it comprehends an assembly hall, 65 ft. long by 30 wide; ten or twelve class-rooms, a dining-hall, and a covered playground, with other necessary offices, the whole covering an area of about two acres.

POTTERY BUILDINGS, WOODVILLE. — Further extensions (being Contract No. 2), are to be made in connexion with Messrs. Outram & Co.'s new works, at a cost of about 3,000*l.*, consisting of a large block of buildings, two stories high, divided into workshops, greenhouses, kilns, and warehouses, from the plans and under the direction of Mr. R. E. Carpenter, architect, Burton-on-Trent. The tenders of Mr. John Varlow, of Burton-on-Trent, has been accepted for the works.

NEW FREE CHURCH, MORNINGSIDE, EDINBURGH.—The foundation stone of the new Free Church, at Morningside, Edinburgh, was laid on the 27th ult., by Dr. Walter Smith. The frontage of the new building is towards Morningside-road. In plan, says the *Scotsman*, the church is of rectangular outline, without transeptal or other projections. Entering a lobby, staircases at each side give access to two cloak-rooms and two class-rooms, and also conduct to the galleries. At the opposite end is the pulpit platform, recessed, and connected with it accommodation for the organ. The church will accommodate about 650 in the area. Two narrow galleries of one seat in depth, projected on cantilevers along the side walls, supply accommodation for about 200 more. There are no pillars or other obstructions supporting these side galleries. The lighting will be by large windows in the upper part of the building, assisted by a range of lunette lights in the cove of the ceiling. There are no windows under the galleries. To the church a range of hall and office buildings is attached at the back of the site. The main hall will accommodate about 250, and, in addition, there are children's class-room to accommodate 60, and a further class-room for advanced pupils. There are also vestry, session-room, heating chamber, and caretaker's dwelling. The main façade towards the roadway represents a rusticated ground floor story, in the centre of which are three doorways. The upper story is relieved with slightly projecting pilasters carrying an entablature with a pedimented centre. On the north side is a winged projection, subordinate to the main structure, whilst on the south side a projecting wing, of larger proportions, is carried up as a tower in plain masonry to a height of about 120 ft., above which the design is relieved with a belfry stage, surmounted by a pyramidal roof. The upper part of the tower is not proposed to be proceeded with under the first contract. The other elevations are treated more simply. In the interior the ceiling rises in eliptical form from the main, entablature carried round the building at the level of the wall head, the surface of the ceiling being relieved with slightly recessed panelling. The architect is Mr. Hippolyte J. Blanc, A.R.S.A., and the cost will be between 8,000*l.* and 9,000*l.*

SCHOOL BUILDINGS, BELFAST.—On the 27th ult. the memorial and keystones were laid of the National Schools now in course of erection in Hurst-street, Sandy-row, Belfast. The building now in course of erection will provide accommodation for 400 pupils, and will cost about 1,800*l.* It is a two-story building, the large room on the ground floor being 40 ft. by 30 ft., and in a room adjoining there is an infants' gallery. There are two porches, with cloakrooms—one for boys and the other for girls, and there are separate staircases leading to the upper room, which is of the same dimensions as the lower one, the only difference being that the infants' gallery is separated from it by screens, instead of being in a separate room. The height of the ceiling in the rooms on the ground floor is 12 ft., and in the upper rooms 20 ft. Tobin tube ventilators are used on each floor. The buildings are constructed of Belfast perforated brick, and are being erected by Mr. Isaac Hewitt. Mr. J. J. Phillips, of Belfast, is the architect. It is proposed to build exactly similar schools in Tierney-street, Blackstaff-road. The total cost of the erection of the two schools will be about 4,000*l.*

WESLEYAN CHAPEL AT NEWHAVEN, SUSSEX. —On the 24th ult. the foundation stones were laid at Newhaven of a new Wesleyan Chapel. Provision is being made for the accommodation of 300 people, at an estimated cost of 900*l.*, and the style adopted will permit of the erection of an end and side galleries if subsequently required. The elevation will contain a circular traceried window over the central entrance, and will be surmounted with stone gables, while the other windows will be glazed with cathedral tinted glass. Internally, pitch-pine will be principally used, and in the rear will be two vestries, kitchen, and a heating chamber, the heat to be distributed by hot air pipes. Mr. Morling, of Seaford, is the builder, and Mr. Charles Bell, of London, the architect.

PROPOSED CORPORATION LODGING-HOUSE FOR LEITH.—The Improvement Scheme Committee of the Leith Town Council have approved of plans for a common lodging-house to be erected by the Corporation in Parliament-street. The plans show a building four stories in height, with a basement floor. The building will be 90 ft. in length, and 43 ft. in breadth, with a back wing of one story. On the basement floor there will be a dining-room, kitchen, wash-house, &c. On the same level, at the back, there will be wash-houses for the lodgers. On the ground-floor there will be a reading and recreation room, board-room, caretaker's room and house. The upper floors will consist of dormitories containing in all 168 beds. The estimated cost, including furnishings, is about 4,000*l.* *Scotsman*.

NEW CHAPEL, SWANSEA.—On the 25th ult. the memorial stones of the new English Calvinistic Methodist Chapel, Terrace-road, Swansea, were unveiled. The new building will be 50 ft. long, 40 ft. high, and 40 ft. broad, and will be capable of accommodating some 300 people. The work of building is entrusted to Messrs. Bennett Brothers, the architect being Mr. J. M. Thomas, Swansea, and the cost of the structure, which is of a Gothic style and built of polled stone with Bath stone facings, will be about 1,100*l.*

CHURCH, NORTON, MALTON, YORKSHIRE.—Further progress is about to be made in the construction of the new church of St. Peter, Norton, Malton. The foundation-stone was laid by the late Archbishop Thomson, on October 16, 1889, the original plan being to complete the church in three efforts—first, the eastern portion, comprising chancel, south chapel, organ chamber, &c.; secondly, the nave and aisles; and, lastly, the massive western tower and porch. This scheme was estimated to cost 8,000*l.*, and the first portion was completed some time ago, at a cost of 3,500*l.*; but the commencement of the second part of the work was delayed for want of funds. Now, however, the contract has been let, and the work will proceed forthwith. Mr. Burton, of Newcastle-on-Tyne, had the first contract. The tender of Mr. Anthony Lyons, builder, of Norton, has been accepted for the nave and aisles; and the erection of the tower, &c., will be left for awhile. Mr. Hodgson Fowler, of Durham, is the architect of the church, which, when completed, will afford accommodation for over 700 worshippers. The chancel and nave will be of Levisham stone, with strings, dressing, &c., of Barnard Castle stone, and arches of Roche Abbey stone. The nave will be 83 ft. long, and will comprise six bays, with north and south aisles. Grundy's patent hot-air apparatus will be inserted. Mr. T. Whitwell, of Norton, will execute the joiner's work; Mr. G. M. Robson, painting and decorating; and Mr. Halliday, of Malton, the plumbing and gas fitting.

SANITARY AND ENGINEERING NEWS.

NEW PIER, DOVER.—On the 22nd ult. the new Promenade Pier at Dover, which has been in course of construction for the last eighteen months, was opened by Lady Dickeson, the wife of Sir Richard Dickeson, Chairman of the Company. The pier is approached from the Marine Parade, and runs out

as nearly as possible in the centre of the bay. It is 900 ft. in length and 30 ft. wide from the entrance gates to the commencement of the pierhead, some 670 ft., when it opens out to a width of 100 ft. There are two embayments on each side of the narrower portion of the pier, in which are placed ornamental kiosks. There are seats at intervals the whole length of the pier, whilst at each corner of the head circular covered wind screens are erected, and wind screens are also placed at other points. The principal architectural feature of the pier will be the pavilion, which has not yet been carried out. The concert-room in the pavilion will be capable of seating 1,000 people, with a stage 38 ft. long by 30 ft. wide, green-room, &c. There will also be a dining-room, refreshment-room, lavatory accommodation, together with four octagonal rooms, to be placed at each corner of the pavilion. A landing stage is also in course of construction. The engineer was Mr. J. J. Webster, Mr. A. Thorne being the contractor.

NEW BRIDGE, NEWBURN, NORTHUMBERLAND.—A new steel bridge, spanning the Tyne at Newburn, has just been opened by the Newburn Bridge Company, Limited. The new bridge consists of four spans of steel lattice girders, the river piers being 103 ft. 6 in. apart centre to centre, the clear width of roadway between the main girders being 18 ft. The river piers are each formed of two cylinders 5 ft. in diameter, of wrought-iron plating, braced together, and filled with concrete and founded on the rock at depths varying from 50 ft. to 71 ft. below high water-mark. The abutments of the bridge are of Portland cement concrete, with Whitburn limestone string courses and capstones. They are founded upon a platform supported by pitch pine piles, at a depth of 15 ft. below high water level. In consequence of the contemplated widening and deepening of the river by the Tyne Improvement Commissioners, the new bridge had to be made more than 100 ft. wider between the abutments than the present width of the river at Newburn, and a clear height of 21 ft. at high water had to be provided for. The engineers were Messrs. J. Watt Sandeman & Moncrieff, C.E., Newcastle, and the contractors were Messrs. Head, Wrightson, & Co., Limited, of Stockton. The engineers were represented on the works by Mr. James H. Barker, and the contractors by Messrs. Irwin and Bigmore.

FOREIGN AND COLONIAL.

FRANCE.—The Conseil-Général of the Seine has commissioned M. Edmond Debon, painter, to decorate the Salle des Mariages of the Mairie of Maison Alfort, near Paris.——A competition will be shortly opened for the pictorial decoration of the Salle des Mariages at the Mairie of Bagnolet. The cost of the intended decoration is estimated at 43,000 francs.——The Minister of Public Works has authorised the Orleans Railway Company to arrange for the opening of a new branch from Bourg-la-Reine to Sceaux-Robinson, in the outskirts of Paris.——In order to inform themselves as to the existing artistic riches of France, the Ministry of Public Instruction have addressed a circular to all the directors of museums in the country, containing a detailed series of questions, and requiring a report from them to the administration in regard to the contents of their museums.—The town of Toul (Meurthe-et-Moselle) has opened a competition for the design and construction of a monumental fountain in marble.——The Société des Architectes of Aisne has organised a committee, with M. Daumet as honorary president, for the erection at Ribemont, near St. Quentin, of a monument to the memory of François Blondel, architect of the Arc de Triomphe of Porte St. Denis, and the first director of the Royal Academy of Architecture in France.——The Jury of the International competition opened at Bucharest of a railway terminus and administration buildings has decreed the first prize to MM. L. Blanc and Marcell. The last-named is a Paris architect. The second premium has also been awarded to a Paris architect, M. L. Farge.——The railway company "de l'Est" is about to establish a direct and express service between Nancy and Lyons, which will have an important influence both commercially and strategically.——The Municipality of Lyons is to submit to the Government shortly a project which has been drawn out by M. Perrignon, engineer, and which consists in establishing over the Rhone a one-arch bridge of steel, 900 mètres in length and twelve in width, between the Boulevard de la Croix Rousse and the Boulevard de Rosel. There is also some talk of a bridge over the Rhone at Avignon, in order to establish a railway line connecting the line from Lyons to Marseilles with that from Lyons to Nimes.

MISCELLANEOUS.

TECHNICAL EDUCATION AND THE PAINTING TRADE.—The first of a course of lectures to painters and decorators was given on Tuesday evening last by Mr. Wm. Fourniss at the Westminster Technical Institute, Mr. Richards (of the firm of Jones, Richards, & Co., Motcomb-street, and Manager of the Trade Classes at the Institute) in the chair. The lecture was much appreciated, and a hearty vote of thanks to the lecturer was given. These lectures are the outcome of the Conference held at the Painter-Stainers' Hall in the early part of the year. The endeavour to raise the quality of workmanship of the operative painter, and to find better means for the proper education of London apprentices has, we are informed, caught the attention of the entire trade. We are very glad to hear it. There are five more lectures announced, and tickets may be obtained at the door.

THE RESTORATION OF KIRKSTALL ABBEY.—According to a local journal, the members of that section of the Corporate Property Committee of the Leeds County Council which has charge of Kirkstall Abbey, and of the excavations and other improvements in progress there, visited the place last week, and had an interview with Mr. Micklethwaite, the architect under whose superintendence the alterations are proceeding. In the course of a tour of inspection over the Abbey and the grounds, Mr. Micklethwaite described what had been accomplished, and what he thought would be the best course to adopt in extending the excavations, and executing further restorative work. He indicated to the committee certain newly unearthed parts of the old fabric, which he suggested were too interesting to be further disturbed, and the committee being favourably inclined towards this idea, talked over the advisability of protecting the work alluded to by an iron fence. All the interesting relics dug up are being preserved, with the intention of their eventually being placed on view in some part of the Abbey. Satisfactory progress is being made with the laying out of the Abbey grounds.

THE CONDITION OF THE THAMES.—The recent drought has had its effect upon the River Thames, for it has been reported for some weeks that the river from Teddington Lock to Kew Bridge has been remarkably shallow at low water, and that the bed of the river has been exposed in many places. This has led to the accumulation of mud and putrid matter on the foreshore, notably at Chiswick, where the Local Board have recently resolved to send to the Conservators a copy of a memorial which has been received from the inhabitants of the district calling attention to this fact. In the memorial it is alleged that the accumulation of offensive material is so great at low water as to cause a noxious smell to emanate which is in all probability injurious to health, and if this be so it is the immediate duty of the Conservators to see to it without delay. Their attention might also be drawn to the probable causes of this nuisance. Now that no sewage is allowed to be discharged into the river until it has been treated, and as in view of the drought it cannot possibly be due to surface drainage, the cause would appear to be a local one. Of local causes, there are the discharge of domestic refuse from the houses situated on the banks of the river and the indiscriminate discharge also of "sewage" and slops from the house-boats in spite of the prohibitory regulations of the Conservancy.—*The Lancet.*

"SWIFT'S PATENT" WALL TILES.—This is a patent for shaping tiles intended for wall covering so as to afford a better key than that supplied by the usual ribbed surface. A core in the form of a cross is inserted at the back of the tile material before it is pressed in the box, the core having bevelled edges which produce an undercut bevel, or dovetail section, in the impression left on the back of the tile. In the kiln the core burns away, leaving the cross-shaped sinking with overhanging edges on the back of the tile, into which the cement is pressed when fixing the tile. It will be readily seen that such a tile must have a much firmer hold than one with merely a ribbed back. The patentee is Mr. Geo. Swift, of Liverpool.

THE SOCIETY OF ENGINEERS.—On Wednesday last a visit was paid by the Society of Engineers to the Water Works, Gas Works, and new "Front" and Harbour improvement works at Ramsgate. The party were conveyed to Ramsgate in a special train, and were received by the Mayor and members and officials of the Corporation, and were entertained at luncheon at the Water Tower. Ramsgate Water Tower was erected in 1878 and 1879 to afford a constant supply of water to the town. Up to that date the supply was intermittent, the inhabitants in the upper part of the town not being able to obtain water until the cisterns in the lower levels had been filled. It is built entirely of brickwork, 50 ft. by 80 ft. on plan, and 60 ft. high, being surmounted by one of the largest elevated cast-iron tanks in the country, which is 10 ft. deep, and holds 250,000 gallons. The weight of the tank is thrown entirely on the cross walls. The whole of the brickwork is composed of common stocks, except the facing of the outside walls, which is of Mid-Kent wire cut red bricks. The pumping main is 15 in. diameter, and the distributing main 18 in. The water is raised from Whitehall, a distance of about two miles, and pumped into the bottom of the tank, the overflow being in direct communication with the low level reservoir holding 750,000 gallons. This arrangement obviates the necessity of making any alteration in the valves during pumping hours. The difference in level between the bottom of the well and the top of the tower is 220 ft. The Gas Works, next visited, were purchased by the town in 1878. Immediately after the transfer it was found necessary to entirely reconstruct the works. The present capacity is about 200,000,000 cubic feet per annum. The retort-house consists of fourteen beds of six retorts each, and five beds of eight retorts each. Gaseous firing is used throughout, and West's manual machinery is used for charging and drawing. The gasholders, of which there are two, have a capacity of 650,000 cubic feet. This in the course of another year will be supplemented by another holder containing about one million cubic feet. With regard to the "front" and harbour improvement works, for the last fifty years the necessity for better communication between the cliffs and the sands had been felt, and various schemes to attain that object had been brought forward at different times, but none, strange to say, until the present one (which was also the first to get the consent of the burgesses), proposed to interfere with the Inner Basin. The water along the north or military wall of the Inner Basin was so shallow as to be of little use for berthing vessels, &c. The work now being carried out was commenced in January, 1892, and consists of a new basin wall to cut off the shallow part, a rising road from York-street to the West Cliff, on the site of the old Military-road, a rising road to the East Cliff, and the pulling down of the Custom House and Harbour Master's house (which will be rebuilt in another position), and the warehouses in the Pier Yard, so as to widen the approach to the L. C. & D. Ry. and sands from the present 15 ft. to 60 ft. The sea-wall is built of concrete and faced with Portland stone, and coped with granite 18 in. deep. The wall is 30 ft. high, 5 ft. 6 in. thick at the bottom, and 4 ft. at the top, with 4 ft. counterforts at intervals of 30 ft. The rising road to the West Cliff is carried on semi-circular arches 30 ft. centres. The party walls are of concrete, the lower ones being 2 ft. 6 in. thick at the springing, and the more lofty ones 3 ft. The arches are built of picked stocks, the thickness being 18 in. The front arches are built in red Pluckley bricks with a moulded cornice and terra-cotta balustrade. The road will have an inclination of 1 in 25. The carriageway will be macadamised, and 30 ft. wide. The footway will be of asphalte, 15 ft. wide. The approach to the East Cliff, to make room for which the Albion Hotel is to be removed, will follow the natural conformation of the ground, and will have an incline of 1 in 14. The approach to the sands will be paved with wood in place of the present cobbles. The Customs House will be rebuilt on the opposite side of the road, and the Harbour Master's House will be rebuilt on the West Cliff. The works are being carried out by Messrs. W. & T. Denne, contractors, from the designs and under the superintendence of Mr. W. A. McIntosh Valon, J.P., Borough Engineer, and President of the Society.

THE ENGLISH IRON TRADE.—Matters continue quiet in the English iron market. Pig iron generally is steady, with but little life in the demand. Finished iron remains in a depressed condition. The tinplate branch maintains its recent movement. The steel trade, on the whole, shows further signs of amelioration. Shipbuilders and engineers are quiet. The coal trade is not very brisk.—*Iron.*

"CREMATION ABROAD."—Mr. T. G. Dee writes to say that in our report (pp. 390-391 *ante*) of his paper on this subject (read before the Sanitary Inspectors' Association), we made him state that the cremated remains placed in the urn at the cemetery of Père la Chaise are sealed with *wax*. As a matter of fact, he says, he did not mention the material; but it is sheet lead that is used for the impression.

MEETINGS.

SATURDAY, JUNE 3.

Architectural Association.—Visit to the old church and chapel, the Old Manor House, &c., at Chenies, Bucks.

Incorporated Association of Municipal and County Engineers.—Yorkshire District Meeting, to be held at Harrogate.

Edinburgh Architectural Association.—Annual Excursion, to Cupar and district.

St. Paul's Ecclesiological Society.—Visit to the Temple Church, under the guidance of Mr. G. H. Birch, F.S.A. 3.30 p.m.

MONDAY, JUNE 5.

Royal Institute of British Architects.—(1) Special General Meeting to consider a Proposal by the Council to modify Bye-law 25; (2) General Business Meeting for the Election of Officers, &c. 8 p.m.

Society of Engineers.—Mr. Robert Carey on "Economical Hydraulic Lifts." 7.30 p.m.

TUESDAY, JUNE 6.

Society of Biblical Archæology.—8 p.m.

WEDNESDAY, JUNE 7.

Carpenters' Company, Carpenters' Hall (Lectures on Carpentry and Joinery).—Professor Banister Fletcher on "Timber; English, Foreign and Colonial: its decay, preservation, and use." 8 p.m.

British Archæological Association.—(1) Mr. Edgar Barclay on "Stonehenge"; (2) Mr. J. H. Macmichael on "The Evil Eye and the Solar Myth"; (3) Dr. A. C. Fryer on "The Mounds of the Kings, Upsala." 8 p.m.

THURSDAY, JUNE 8.

Society of Antiquaries.—8.30 p.m.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

10,705.—WATER-CLOSETS: *F. G. Underhay.*—This invention relates to what are known as regulator closets, in which the time of closing the valve supplying water to the pan is regulated by the descent of a weighted piston or bellows, which forces air out of the cylinder. Contrary to the usual method, the handle only acts on the valve whilst being pulled upon, so that the closing of the valve commences directly the motion of the handle ceases. In

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
*Public Library and Technical School	Boro of St. Helen's	100l. 50l. and 25l.	July 24
*New Municipal Buildings	Darlington Corp.	.....	No date
*School	Swansea School Board	15 and 10 guineas	do.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Guernsey Granite (500 tons), &c.	Milton-next-Sittingbourne Impt. Com.	*Official*	June 6
Bridge and Approaches, King's Bridge	Glamorgan C. C.	do.	do.
Iron Castings and Stores	N. E. Ry. Co.	do.	do.
Permanent Way Materials	do.	do.	do.
Granite Setts	Bootle Corp.	J. A. Crowther	do.
Additions, &c. to School, Stoke-upon-Trent	Church School Board	R. Scrivener & Sons	do.
Restoration of Wesleyan Chapel, Cubert, near Redruth	E. C. Glasson	Sampson Hill	do.
Cast-iron Pipes (1,540 tons)	Manchester Corp.	T. H. G. Berrey	do.
Extension of "Junction Hotel," Bargoed, S. Wales	A. H. Stowell	.....	do.
Sewer, Skerries, Ireland	Union Guardians	J. C. M. Tuite	June 7
*Tar Paving	Southend-on-Sea Corp.	C. T. Copley	do.
Shops and Houses, Hipperholme, Halifax	.....	J. Brooke & Sons	do.
Additions, &c. to Premises, Bartholomew-street	Newbury Corporation	E. A. Stickland	do.
Warehouse Extension, Ramsey Brow, Workington	W. & J. M. Steel	Jas. Howes	do.
Two Brick Sewers	Rochdale Corporation	S. S. Platt	do.
Pulling-down Fire Brigade Station and Erection of Shops	Halifax Corporation	E. R. S. Escott	do.
Fountain, &c. Tillystown, Ireland	Rathdown Union	*Official*	do.
Additions to School Buildings	Dundee School Board	do.	do.
Water Pipe Laying, &c. Brixton, Devon	Plympton St. Mary Sanitary Authority	do.	June 8
Water Supply Works, Coldstream, N.B.	Police Commissioners	Leslie & Reid	do.
Boundary Walls and Laying-out Grounds, St. Anne's-on-the-Sea	.....	Walker & Collinson	do.
Cottage Homes, near Workhouse, Healdsroad	Staincliffe (Dewsbury) Union	Holtom & Fox	do.
Iron Castings, Covers, &c.	Southport Corporation	W. Crabtree	do.
Making-up Two Streets	Tunstall Local Board	A. R. Wood	do.
Mill, Ellar Carr, Cullingworth, Bradford	.....	J. Robertshaw & Son	do.
*Electric Supply Station, &c. &c.	St. John's Vestry, Hampstead	A. Ardron	do.
Lime (2,500 tons)	Stockport Corporation	S. Meunier	do.
Flint, Ragstone, and Granite Road Metal	Chatham Corporation	Chas. Day	do.
Farmhouse, Cottage, Road, &c. Harrop Edge, Oldham	.....	Jno. Kirk & Sons	do.
*Well Boring	Sandwich Corporation	A. J. Catt	June 10
School Buildings, &c. Kingsley, Staffs.	.....	Larner Sugden	do.
Slaughter-house, Shop, &c. Acklington	Bromhill Co-op. Soc.	Oliver & Leeson	do.
Supply and Laying Cast-iron Water Pipes (2,200 yds.)	Lauder (N.B.) Waterworks Commrs.	W. Tait	do.
Additions, &c. to Dwelling House, Shincliffe, Durham	Thos. Hodgson	H. T. Gradon	do.
Drain Pipes, Lime, &c.	Cambrian Rys. Co.	*Official*	do.
Lime (800 tons)	Walsall Corporation	do.	do.
Lavatory, &c. St. Ann's Church	Manchester Corp.	do.	June 12
*Sewerage Works	Swansea T.C.	do.	do.
Iron Castings, Stores, &c.	Waterford & Limerick Ry. Co.	do.	do.
*Paving New Streets	Camberwell Vestry	do.	do.
Kitchen, Chimney Stack, &c, at Workhouse	Stone (Staffs) Union	J. J. Chapman	do.
School Extensions, near Barnsley	Hoyland Nether Sch. Board	W. J. Sykes	do.
Timber and Masonry Pier, Baden-Tarbat Loch Broom	Ross-shire C.C.	Jas. Barron	do.
Warehouse, Bradford	.....	Milnes & France	do.
Sewering, Paving, &c. (22 roads)	Swindon New Town Local Board	H. J. Hamp	do.
*Furnaces at Sanitary Depôt	Hornsey Local Board	T. De Courcy Meade	do.
*Private Street Works	Barking Town L.B.	C. J. Dawson	June 13
*Sewer and Paving Works	Tottenham Local Bd.	J. E. Worth	do.
*Drainage of Recreation Ground	Willesden Local Board	O. Claude Robson	do.
*Fencing Recreation Ground	do.	do.	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Drainage of Kilburn-square	Willesden Local Board	O. Claude Robson	June 13
*Cemetery, Chapel, and Laying-out Grounds	Alfreton Local Board	*Official*	June 14
*Purchase and Demolition of Houses	St. Mary's Vestry, Battersea	do.	do.
Passenger Station, Wigan	L. & Y. Ry. Co.	do.	do.
Alterations, &c. Corn Exchange	Rochester Corp.	do.	do.
Timber Supply	South Hetton Coal Co.	J. R. Lambert	do.
Quay Extension, Warehouses, &c.	Southampton Harbour Board	E. Cooper Poole	do.
Filter Beds, &c. Gammaton	Bideford U.S.A.	Baldwin Latham	do.
*Waterworks and New Road	do.	do.	do.
*Two Pavilions at Hospital	St. Helen's Health Committee	Geo. J. C. Broom	do.
*York Stone Paving	Rochester, Chatham, and Stroud Gaslight Company	*Official*	June 15
*Basement Floor at Art Galleries	Glasgow Association for Promotion of Art and Music	Simpson & Allen	do.
Additions to Ashley Hall, Newmarket	Lord North	Frank Whitmore	do.
*Casual Wards, Gt. Guildford-street	St. Saviour's Union	H. Jarvis & Son	do.
*Pair of Villas, Meopham, Kent	.....	Stenning, Jennings	do.
*Painting Asylum Buildings	Kent County Council Asylums Committee	do.	do.
Isolation Hospital at Asylum, Moulsford, Berks	Committee of Visitors	G. T. Hine	June 16
Widening Bridge over River Avon, Aberavon	Rhondda and Swansea Bay Ry. Co.	S. W. Yockney	June 19
*Stabling, Underground Convenience, Wood, &c. Paving Works, &c.	Westminster Vestry	G. W. R. Wheeler	June 21
*Drainage Works	East Molesey Loc. Bd.	J. C. Mellis	do.
*Intermediate, &c. School	Neath Town Council	D. M. Jenkins	June 22
*Alterations, &c. at Infirmary	St. Olave's Union	Newman & Newman	do.
*Iron Promenade Pier	Douglas Town Com.	*Official*	do.
*Two Pumping Engines, &c.	Leicester Corporation	J. B. Everard	June 24
*Cast-iron Socket Mains, &c.	Hinckley U.R.S.A.	.....	do.
*Additional Wing	Cambridgeshire Asylum Committee	R. R. Rowe	do.
Retort Houses and Works	Bridgend Gas & Water Co.	*Official*	June 30
Flint Road Metal (1,900 yds.)	Aylesbury Local Board	do.	No date
*Painting Works, Aldershot	War Department	do.	do.
Additions, &c. Police Barracks	Leeds Corporation	do.	do.
Dam, Maesgwyn, Salop	Bishop's Castle T. C.	do.	do.
"Canterbury Arms" Inn, Ashton-under-Lyne	.....	J. Eaton & Sons	do.
Roads and Sewers, Westbourne Park Estate, Bournemouth	.....	Hawker & Mitchell	do.
Cottage and Shop, Woking	.....	Peak & Lunn	do.
Two Semi-detached Villas, Leeds	.....	T. Butler Wilson	do.
Switchback Railway, Malpas	Entertainment Council	.....	do.
Twelve Cottages, Bowling, Bradford, Yorks	.....	Andrew Lister	do.
Stables and Outbuildings, Rotherham	J. Searby	.....	do.
Sewerage Works, Todmorden, Portsmouth	Francis E. Fraser	.....	do.
Nine Sale Shops and Houses, Ranmoor, Sheffield	J. Atkinson	.....	do
Large Brick Tank, Staveley Gasworks, Chesterfield	.....	Westwood & Wright	do.
Paving Bricks, Macadam, Setts, and Kerbs	Tunstall Local Board	A. R. Wood	do.
Residence and Stables, Wrexham	E. D. Evans	T. G. Williams	do.
Two Houses, Trimdon Station, Durham	Trimdon Colliery Co.	R. Makepeace	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
Surveyor	Mexborough Loc. Bd.	140l.	June 7
*Assistant Surveyor	Islington Vestry	200l.	June 10
*Assistant Surveyor	Bermondsey Vestry	100l.	do.
Surveyor	Maesteg Local Board	150l.	June 12
*Foreman Stone Maker	Boro of West Ham	2l. 10s.	June 13
*Sanitary Inspector	Westminster Vestry	130l.	June 15
*Waterworks Engineer	Brighton Town Council	450l. &c.	June 26
*Surveyorship, Ireland	Civil Service Commis.	.....	June 29

Those marked with an Asterisk (*) are advertised in this number. *Competitions, p.* iv. *Contracts pp.* iv., vi., viii., *and* xxii. *Public Appointments, p.* xx.

ddition to the regulator another air cylinder is provided, having within it a piston or bellows, whose rod is connected with the handle. This cylinder, which may be called the pump cylinder, is connected by a non-return valve to the regulator cylinder. The effect of a pull on the handle is, first, to force air from the pump cylinder into the regulator cylinder, opening the supply valve in the usual way, but immediately the passage of air into the regulator cylinder ceases the valve begins to close again, whether the handle be held or not.

14,336.—ARTIFICIAL STONE: *J. E. Keseling and C. Fuchs.*—This invention relates to artificial stone compositions, and its object is to provide a composition of comparatively cheap materials, easily prepared, and then converted into stone of great density and durability, and which will more particularly withstand sudden and extreme changes of temperature. The stone is made of a composition consisting of a basic cement of oxide of magnesium and neutral chloride of magnesium, asphaltum, and sand, or analogous material. The resultant stone is dried, and then immersed in hot water to drive off the chloride.

3,338.—ARTIFICIAL STONE: *C. George.*—This invention, connected with improvements in the manufacture of artificial stone, relates not to the employment of any particular mixture of cement, or the like, but in the first place to a method of constructing ropes, lines, or cords of jute, hemp, flax, Indian grass, or the like, tarred or otherwise, and with or without an inner core of spring steel or other metal. These are used singly or woven, laced, or platted together, and interposed within the substance of the artificial stone to promote the elasticity and add to its strength. In the second place the invention consists of an apparatus to be employed in conjunction with the above fabric in the manufacture of lengths of tubes or pipes for drains, and other purposes, made of artificial stone.

6,864.—BRICKS: *S. Ballard.*—This invention has for its object a brick for paving, coping, and other purposes, so made that when laid a portion of each brick overlaps a portion of the adjoining brick, or bricks. This is effected by making the bricks of special shapes. For instance, in the case of a square brick, at just half its depth a shoulder may be formed by letting the upper half lap over at two sides, and the lower half lap over at the other two sides, so that the brick would have the same appearance on both sides. The brick, if made as though in three slices with the middle slice out of line edgewise with the top and bottom, would leave a recess, instead of a ledge, in two edges, and also a tongue or tongues to enter the recess, or recesses, in the other edge. In other cases, such as coping, or sill bricks, there would only be a projecting tongue, or tongues, at one end, and a recess or recesses at the other end.

10,111.—CHIMNEY CAPS: *J. S. Williams.*—The object of this invention is to provide an artificial cap, outlet, or outlets for chimneys, ventilating shafts, and the like, which may be placed above the main stack, or other chimney or shaft, for the purpose of preventing wind currents from entering the main shaft or chimney proper. The cap, or top, is formed of earthenware or any other suitable material, and somewhat after the fashion of an ordinary cap, but having on one side two openings, or mouths, with lower lips projecting inwardly and upwardly and forming diaphragms, so as to deflect wind entering the mouth or top downwardly and outwardly. On the opposite side of the cap is placed one of these lipped openings, about midway between the first two, and so alternating therewith. There may also be formed near the top of the cap, and opposite the uppermost lip mouth, one or more openings of ordinary louvre form.

13,108.—DOOR BOLTS: *J. Anderson.*—This invention consists of a bolt, or catch, applied to doors swinging outwards in places of public resort, and so constructed that while it holds the door in position, when shut it yields to certain pressure. A plate is attached on the outside of the door, having one end of the bolt hinged to it, the other end being provided with a hook extending to the inner side, and catching into a socket fixed in the frame, and held in by a spring. Thus the fulcrum of the bolt being at an angle from the socket when the door is pressed outward, the spring yields until the hook is raised out of the socket and the door opens.

NEW APPLICATIONS FOR LETTERS PATENT.

MAY 15.—9,676, R. & J. Shaw, Automatic Saw-sharpening Machine.—9,687, G. Chambers, Stove-grates and Fireplaces.—9,724, J. Clark, Fire-grates or Stoves.—9,737, J. Michell, Sash-fasteners.

MAY 16.—9,770, L. Ellis and others, Water-closets.—9,794, C. Hattersley, Fireplaces.—9,798, A. Simonis, Water-closet Seats.—9,803, P. Massau, Scaffolding.—9,825, E. Edwards, Paint.

MAY 17.—9,841, F. Durham, Hinges.—9,879, H. Markley, Testing Drains.—9,897, H. Sherwin, Continuous Kilns.—9,898, H. Sherwin, Manufacture of Blue or Vitrified Bricks, Tiles, Pipes, &c.—9,900, M. Brophy, Heating and Circulating Water for Warming Buildings, and for use in Lavatories, &c.—9,911, J. Martin, Window-sashes.

MAY 18.—9,917, P. Hobbs, Friction Hinges.—9,930, J. Renison, New Material for making Varnish, &c.—9,960, J. Shewell, Channelled Flooring for Bridges, &c.—9,961, J. Woodcock, Water-closet Fixtures.—9,979, I. Jonas, Sash-fasteners.—9,984, H. Wilcke, Heating and Ventilating Buildings.

MAY 19.—9,998, H. Green, Thumbpiece used in Lifting Latching Bars of Door Handles.—10,030, W. Gibbs, Centre Plate Hinges or Hinge Joint.—10,034, E. Poppe, Closets.—10,044, T. Banks, Fireproof Floors, Ceilings, &c., partly applicable to other Forms of Floors, Ceilings, and Partitions.—10,045, T. Banks, Fireproof Framing for Partition and other Walls.—10,060, L. Chevenier, Tension Device for Saws.

MAY 20.—10,065, A. Shore, Bench Holder for Wood Carvers and Joiners.—10,069, W. Morgan, Ventilation of Sewer-entrance Covers, &c.—10,103, J. Baker and C. Fyfe, Plaster Board.—10,111, J. Martin, Gas Chandeliers. 10,113, W. Bartholomew, Locks for Water-closet Doors, &c.—10,117, H. Cleaver, Applying Paints, Varnishes, or Stains to Surfaces.—10,137, F. Willett, Temporary Supports for Tunnels, Sewers, &c.—10,141, J. Reynolds, Heating and Ventilating Rooms, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

5,268, W. Pates, Water-closet Traps.—5,389, H. Ward, Pedestal Water-closet with Seat attached.—6,887, J. Fallas, Grooved Picture-frame Moulding.—7,238, J. Glendenning, Fanlight Openers.—7,786, A. Boult, Wood Coverings for Walls, &c.—7,894, C. Haigh, Material for Use in the Construction of Pavements, Floors, Walls, Stair-treads, &c.—7,983, C. Oliver, Seats for Water-closets.—8,147, D. Keith, Bath Fittings.—8,466, J. Gibson and A. Callander, Flushing Cisterns for Water-closets, &c.—8,643, W. Sykes, Interceptors for Sewers or Drains.—8,751, T. Brown, Window-sashes.—8,821, L. Fornander, Band Saws.—8,841, N. Sandiford.—8,842, J. Hacking, Chimney Cowls and Ventilators.—8,844, J. Douglas, Heating and Ventilating Buildings.—8,853, W. Needham, Wood Screws.—8,863, F. Pover, Ovens and Kilns for the Firing of Bricks, Tiles, &c.—8,989, J. Easthope and G. Nedderman, Weather Excluder for Doors and Windows.—9,203, R. Allen, Clamping Apparatus for Laying Floors, &c.—9,208, E. Sheldon, Levelling.

—9,289, W. Hargreaves, Fireproof Stages for Theatres and other Buildings.—9,381, W. Crookes, Glazing of Bricks, &c.

COMPLETE SPECIFICATIONS ACCEPTED.
(Open to Opposition for Two Months.)

12,071, W. Pick, Water Mains and Water Service Pipes.—265, F. Martin, Chimney Pot.—3,770, J. Williams, Cavity Building Bricks.—7,078, G. Redfern, Ventilators.—7,779, W. Pitt, Folding Gates.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

MAY 23.—By *F. J. Bisley & Sons:* 1 and 3, Reverdy-rd., Bermondsey, u.t. 45 yrs., g.r. 9*l.*, 615*l.*—By *Graves & Son:* 12, Kildare-ter., Bayswater, u.t. 58 yrs., g.r. 7*l.*, 315*l.*; 30, Aldridge-rd.-villas, u.t. 57 yrs., g.r. 10*l.* 10s., r. 75*l.*, 600*l.*

MAY 24.—By *Glover & Harrison:* Detached Residence, Campden-rd., Croydon, u.t. 97 yrs., g.r. 14*l.*, 810*l.*; 60, Henry-st., St. John's Wood; and 24A, Townshend Cottages, u.t. 24 yrs., 80*l.*—By *Holland & Andrews:* 47, Bessborough Gardens, Westminster, u.t. 40 yrs., g.r. 9*l.*, r. 70*l.*, 740*l.*; 2, Southerton-rd., Hammersmith, f., r. 36*l.*, 550*l.*—By *J. A. Jones:* 116, Broomwood-rd., Wandsworth, u.t. 94 yrs., g.r. 6*l.* 10s., 380*l.*—By *Eastman Bros.:* 29, Duke-st., St. James's, u.t. 67 yrs., g.r. 33*l.*, r. 368*l.*, 4,000*l.*—By *R. Tidey & Son:* 31, Church-rd., Kingsland, u.t. 24 yrs., g.r. 7s., 310*l.*; 92 to 98 even, Haggerston-rd., u.t. 46 yrs., g.r. 8*l.*, r. 168*l.*, 1,200*l.*; 2, 8, 12, Albion-rd., u.t. 46 yrs., g.r. 8*l.*, r. 113*l.*, 900*l.*; 32 to 44 even, Acton-st., u.t. 26 yrs., g.r. 21*l.*, 875*l.*—By *D. Young:* 23, 25, Almack-rd., Wandsworth, f., r. 72*l.*, 895*l.*; 25 to 31 odd, Birdhurst-rd., u.t. 87 yrs., g.r. 28*l.*, 880*l.*; 35 to 43 odd, Birdhurst-rd., u.t. 87 yrs., g.r. 35*l.*, 1,090*l.*; 22 to 48 even, Dempster-rd., u.t. 83 yrs., g.r. 92*l.*, 3,010*l.*; 2 to 10 (even), Fullerton-rd., u.t. 82 yrs., g.r. 22*l.* 10s., 840*l.*; 53 to 63 (odd), Myddleton-rd., Hornsey, u.t. 74 yrs., g.r. 44*l.* 2s., 440*l.*; 102, 104, St. Thomas-rd., Highbury, u.t. 75 yrs., g.r. 9*l.* 10s., 600*l.*; 3, Daneville-rd., Camberwell, u.t. 69 yrs., g.r. 8*l.*, r. 35*l.*, 260*l.*; 17 to 20, Verranroad, Balham, u.t. 74 yrs., g.r. 26*l.* 13s. 4d., 405*l.*; 58, 64, Yerbury-rd., Holloway, u.t. 74 yrs., g.r. 13*l.* 10s., 425*l.*; 1 to 23 (odd), Medwin-st., Brixton, u.t. 82 yrs., g.r. 73*l.* 16s., 1,980*l.*; 19 to 35 (odd), Ducie-rd., u.t. 82 yrs., g.r. 66*l.* 3s., 1,775*l.*; 32, Jeffries-rd., Clapham, u.t. 48 yrs., g.r. 20*l.*, r. 40*l.*, 150*l.*; 38 to 72 (even), Crampton-rd., Penge, u.t. 78 yrs., g.r. 75*l.* 12s., 2,070*l.*; 11 to 49 (odd), Crampton-rd., u.t. 78 yrs., g.r. 84*l.* 12s., 2,135*l.*; 1 to 7, Queen's-ter., Winchester, u.t. 971 yrs., g.r. 24*l.* 10s., 105*l.*; 2, 3, 4, Chandos-rd., Broadstairs, u.t. 76 yrs., g.r. 30*l.*, 115*l.*—By *Woods & Snelling* (At Snodland): F.g.r. of 8*l.*, Burham, Kent, reversion in 16 yrs., 200*l.*; four f. cottages, Rochester-rd., 165*l.*; a plot of f. land, Burham Hill, 1a. 0r. 20p., 37*l.*

MAY 25.—By *Slade & Butler:* 13, Dorville-rd., Lee, u.t. 82 yrs., g.r. 10*l.*, 400*l.*; 1, Osberton-rd., u.t. 70 yrs., g.r. 8*l.*, r. 40*l.*, 300*l.*—By *G. B. Hilliard & Son:* "Champion's Farm," Woodham Ferris, Essex, 531a. 1r. 37p., r. 250*l.*, 4,500*l.*—By *W. W. Jenkinson:* 3 to 17 (odd), Ducie-st., Stockwell, u.t. 82 yrs., g.r. 57*l.* 18s., 1,510*l.*; 38, 40, Sheldrake-rd., Battersea, f., r. 62*l.*, 775*l.*; 17, 19, 23, Park-pl., Clapham, u.t. 17 yrs., g.r. 5*l.*, 160*l.*—By *H. Abrahams & Sons:* F. stabling and yard, Brixton Hill, r. 84*l.*, 1,350*l.*—By *C. C. & T. Moore:* 23, Eastward-st., Bromley-by-Bow, f., 150*l.*; 12 to 18 (even), Richard-st., St. George's-in-East, u.t. 8 yrs., g.r. 9*l.* 10s., 215*l.*; 76, Globe-rd., Mile End, f., 370*l.*; 61, Globe-rd., and White's Cottage, u.t. 17 yrs., g.r. 6*l.* 14s. 6d., 265*l.*; 34, 36, Tylney-rd., Forest Gate, u.t. 96 yrs., g.r. 8*l.*, 310*l.*; 191, Milkwood-rd., Brixton, u.t. 73 yrs., g.r. 5*l.*, 220*l.*; 64, 65, 66, Upper East Smithfield, Whitechapel, and 46 Dock-st., u.t. 40 yrs., g.r. 52*l.* 16s., 700*l.*—By *Stimson & Sons:* Nos. 208, 210, Brockley-rd., u.t. 79 yrs., g.r. 8*l.* 14s., r. 58*l.*, 520*l.*; 17, Luxor-st., Camberwell, u.t. 71 yrs., g.r. 4*l.*, 410*l.*; 36, 38, Daneville-rd., Denmark Hill, u.t. 70 yrs., g.r. 11*l.*, r. 73*l.*, 700*l.*; 18, 20, 22, Harrow-st., Southwark, u.t. 39 yrs., g.r. 13*l.*, 470*l.*—By *Pinder, Simpson, & Newman:* L.g.r. of 13*l.*, Bishop's-rd., Highgate, u.t. 80 yrs., 240*l.*; "Ivyside" and "Ferndale," Blomfield-rd., u.t. 80 yrs., g.r. 22*l.*, r. 115*l.* 10s., 705*l.*; a plot of land, Bishop's-rd., u.t. 80 yrs., g.r. 10s., 325*l.*; 7 to 12, Park-ter., u.t. 80 yrs., g.r. 61*l.*, 960*l.*; 1 and 2, Blomfield-villas, u.t. 80 yrs., g.r. 20*l.*, r. 140*l.*, 955*l.*—By *Newbon & Co.:* 45, Huntingdon-st., Barnsbury, u.t. 56 yrs., g.r. 7*l.*, r. 42*l.*, 405*l.*; 6, Crescent-st., u.t. 56 yrs., g.r. 1*l.*, r. 36*l.*, 365*l.*; 67, 69, 71, 75, 77, 79, Southampton-st., Pentonville, u.t. 50 yrs., g.r. 30*l.*, r. 252*l.*, 2,235*l.*; 17, Southern-st., u.t. 50 yrs., g.r. 1*l.*, 255*l.*; 21, 27, 29, 31, Somerfield-rd., Finsbury-pk., u.t. 73 yrs., g.r. 23*l.* 6s., r. 155*l.*, 1,340*l.*; 31, Walford-rd., Stoke Newington, u.t. 71 yrs., g.r. 5*l.* 10s., r. 38*l.*, 425*l.*; 17, De Beauvoir-sq., Kingsland, u.t. 19 yrs., g.r. 4*l.*, r. 38*l.*, 220*l.*; 35, Church-rd., u.t. 25 yrs., g.r. 8*l.*, r. 38*l.*, 225*l.*—By *W. Bradly:* 5, 6, Stockwell-st., Greenwich, f., r. 45*l.*, 300*l.*; f.g.r. of 30*l.*, Amersham Vale, New Cross, reversion 69½ yrs., 764*l.*; f.g.r. of 6*l.*, reversion in 70 yrs., 153*l.*; i.g.r. of 18*l.*, Ashburnham Grove, Greenwich, u.t. 54 yrs., g.r. 8s., 300*l.*; 6, 8, Sach-rd., Clapton, u.t. 89 yrs., g.r. 11*l.*, 740*l.*; 3, Chestnut-rd., Tottenham, f., r. 21*l.*, 275*l.*—By *Jenner & Dell:* C.g.r. of 20*l.*, Grove-ter., Hounslow, reversion in 89 yrs., 385*l.*; f.g.r. of 24*l.*, Moss Villas, reversion in 93 yrs., 600*l.*; 1 and 2, Venitia Villas, f., r. 44*l.* 19s., 690*l.*; two plots of f. land, York-rd., 127*l.*; "Laburnham Villa," Bath-rd., f., r. 35*l.*, 295*l.*; 1, 2, 3, Reginalds-ter., f., 455*l.*; 1 and 2, St. Paul's Cottages, f., 190*l.*; 1 and 2, St. Leonards; and 1 and 2, Albion-pl., f., 695*l.*; "Inwood House," Inwood-rd., f., r. 28*l.*, 250*l.*; a plot of f. land, 105*l.*; 5, 6, 11, 12, Anderson-pl., f., 87*l.*; 1, 2, and 3, Whitmarsh's Cottages, New Heston; and plot of land, f., 220*l.*; 1 to 4, Whitmarsh's Cottages, Old Heston, f., 225*l.*

MAY 26.—By *A. Watson:* 1, 2, 3, Bury-st. cottages, Edmonton, f., 200*l.*; 36, Sunderland-rd., Forest Hill, u.t. 82 yrs., g.r. 16*l.*, r. 60*l.*, 700*l.*—By *Protheroe & Morris:* The f. residences "Priory Lodge," "Holly Mount," "Thornwood," Orford-rd., Walthamstow, and 9a. 3r. 22p., 9,800*l.*—By *Green & Son:* 101, High-st., Whitechapel, u.t. 44 yrs., g.r. 75*l.*, r. 200*l.*, 1,340*l.*; 2, Cable-st.; and 1, Dock-st., u.t. 40 yrs., g.r. 20*l.*, r. 135*l.*, 1,330*l.*—By *Rutley, Son, & Vine:* 4, Market-st., Barnsbury, u.t. 40 yrs., g.r. 6*l.*, 290*l.*; 8 and 9, Clarence-gardens, Regent's-pk., u.t. 29 yrs., g.r. 36*l.* 18s., 450*l.*

[*Contractions used in these Lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G. ton	9/0/0	0/0/0
Teak, E.I. ..load	9/0/0	15/0/0
Sequoia, U.S.ft.cu.	2/3	2/6
Ash, Canada load	2/15/0	4/5/0
Birch, do.	2/15/0	3/15/0
Elm, do.	3/15/0	4/15/0
Fir, Dantsic, &c.	1/10/0	3/5/0
Oak, do.	3/5/0	5/10/0
Canada	5/10/0	7/0/0
Pine, Canada red	2/15/0	3/15/0
Do. Yellow	2/10/0	4/10/0
Lath, D'ntsic, fath	4/10/0	5/10/0
St. Petersburg..	5/0/0	6/10/0
Deals, Finland and & 1st std 100	7/0/0	9/10/0
Do. 4th & 3rd ..	6/10/0	7/0/0
Do. Riga	6/10/0	8/0/0
St. Petersburg, 1st yellow	10/0/0	14/0/0
Do. 2nd yellow..	8/0/0	9/0/0
Do. white	8/0/0	10/0/0
Swedish	7/10/0	16/0/0
White Sea	8/0/0	16/10/0
Canada, Pine 1st	21/0/0	28/10/0
Do. do. 2nd	16/0/0	17/10/0
Do. do. 3rd &c.	7/10/0	10/5/0
Do. Spruce, 1st	8/10/0	11/0/0
Do. do. 3rd & 2nd	6/10/0	8/0/0
New Brunswick	6/10/0	7/10/0
Battens, all kinds	3/0/0	15/0/0
Flooring boards, sq., 1 in. prep. 1st	0/9/6	0/16/6
Do. 2nd	0/8/0	0/12/0
Other qualities—	0/4/6	0/7/6
Cedar, Cuba ..ft.	/4	/4½
Honduras, ..&c	/4	/4½
Mahogany, Cuba	/4	/6½
St. Domingo, cargo av.	/4	1/6
Mexican do. do.	/3½	/4½
Tobasco do. do.	/3½	/6½
Honduras do. ..	/4½	/6
Box, Turkey ton	4/0/0	13/0/0
Rose, Rio	9/0/0	20/0/0
Bahia	8/0/0	18/0/0
Satin, St. Domingo ..ft.	0/0/6	0/1/3
Porto Rico	0/0/7	0/1/6

TIMBER *(continued)*.		
Walnut, Italian ..	0/0/3½	0/0/7
METALS.		
Iron—Pig, in Scotland ..ton	2/0/8	0/0/0
Bar, Welsh, in London	5/17/6	6/0/0
Do. do. at works in Wales	5/7/6	5/10/0
Do. Staffordshire, in London	6/0/0	6/10/0
COPPER—British, cake and ingot	46/0/0	46/10/0
Best selected ..	47/10/0	48/0/0
Sheets, strong ..	55/0/0	56/0/0
Chili, bars	42/17/6	43/5/0
YELLOWMETALlb	0/0/4½	0/0/5
LEAD—Pig, Spanish..ton	9/7/6	9/10/0
English com. brands	9/10/0	9/12/6
Sheet, English, 6 lbs. per sq. ft. and upwards	11/0/0	0/0/0
Pipe	11/10/0	0/0/0
ZINC—English sheet ton	22/0/0	0/0/0
Vieille Montagne	22/10/0	0/0/0
TIN—Straits	85/7/6	85/17/6
Australian	85/17/6	86/7/6
English Ingots..	91/0/0	91/10/0
Banca	87/10/0	87/15/0
Billiton	87/0/0	87/5/0
OILS.		
Linseed ..ton	19/17/6	20/0/0
Cocoanut, Cochin	29/5/0	0/0/0
Do. Ceylon	27/5/0	0/0/0
Palm, Lagos	28/0/0	0/0/0
Rapeseed, English pale	25/10/0	26/0/0
Do. brown	24/5/0	24/10/0
Cottonseed ref.	22/10/0	22/15/0
Oleine	22/0/0	24/0/0
Lubricating, U.S.	4/0/0	5/0/0
Do. refined	5/10/0	12/0/0
TAR—Stockholm barrel	0/18/6	0/0/0
Archangel	0/12/6	0/0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.*]

ACTON.—For the erection of a new Police-station at Acton, for the Receiver for the Metropolitan Police District. Mr. John Butler, Architect. Quantities by Mr. W. H. Thurgood:—

		Credit.
J. Chessum & Son	£3,790	£20
Perry & Co.	3,802	50
Lawrence & Son	3,757	10
Higgs & Hill	3,750	10
Brass & Son	3,722	1
Hart Bros.	3,679	—
Grover	3,670	—
Ansell	3,633	50
Smith & Son	3,596	25
Scrivenor	3,513	16
Lathey	3,480	25

BARNSLEY.—Accepted for the erection of four houses, &c. Birdwell, for Mr. F. Carr. Mr. Walter J. Sykes, architect, Hoyland, near Barnsley, Yorks:—

Mason, &c.—F. G. Robinson, Birdwell	£510 0 0
Joiner, &c.—Geo. Cook, Hoyland Common near Barnsley	152 5 0
Slater.—E. Fleming, Barnsley	36 10 0
Plasterer.—J. McPartlain, Platt's Common	48 0 0

BLAENAVON (Mon.)—Accepted for the erection of a Workmen's Institute, Blaenavon. Mr. E. A. Lansdowne, architect, National Bank of Wales Chambers, Newport, Mon:—

John Morgan, Blaenavon £5,692 0 0

BOURNEMOUTH. — For the erection of a police-station, Boscombe. Mr. Jas. Robinson, architect, 13, Southgate-street, Winchester:—

F. Walden	£3,734	E. Bath & Co.	£3,385
Entwisle & Cox	3,500	J. W. Lucas (accepted)	3,195
F. Hoare & Sons	3,400	[All of Bournemouth.]	

BRACKNELL.—For additions to house at Bracknell, Berks., for Mr. C. J. Cave. Mr. A. E. Sidford, architect, Wokingham and Bracknell:—

G. Brown	£500	J. B. Seward, Wokingham*	£345
Talbot Bros.	450	*Accepted.	

BRIGHTON.—For additions to laundry, &c., Victoria Baths, Park-street, for the Town Council of the Borough of Brighton. Mr. Francis J. C. May, C.E., Borough Surveyor, Town Hall, Brighton:—

Longley & Co.	£1,145	W. A. Field & Co.	£810
Bishop & Co.	950	Sattin & Evershed, Brighton (accepted)	785
Barber & Olliver	900		

BRIGHTON.—For the erection of higher grade schools at York Place, Brighton, for the Brighton and Preston School Board, U.D. Mr. Thomas Simpson, 16, Ship-street, Brighton, and Mr. John W. Simpson, 10, New Inn, Strand, W.C., joint architects:—

Bishop & Co.	£17,662 15 0	J. Longley & Co.	£14,875 0 0
Kilby & Gayford	16,730 0 0	P. Peters	14,767 0 0
Mid Kent Building Co.	16,652 0 0	C. J. Slade	14,601 9 6
W. Wallis	15,957 9 0	W. Taylor, Brighton*	13,926 17 0
J. T. Chappell	15,594 0 0	*Accepted.	

BRIGHTON.—For the erection of Wesleyan Church and School, West Brighton, for the Rev. Dr. Finnemore, M.A. Mr. T. E. Lidiard James, architect, Lonsdale Chambers, 27, Chancery-lane, W.C. Quantities by Messrs. Evans & Deacon, Charing Cross, S.W.:—

Barber & Olliver	£3,695	Rowlands Bros.	£3,249
Sattin & Evershed	3,450	J. Allen & Sons	3,065
J. Shillitoe & Son	3,350	P. Peters	3,050

BURTON-ON-TRENT.—For the erection of a Wesleyan church at Woodville. Mr. A. T. Greenwood, architect, Woodville, near Burton-on-Trent. Quantities by Mr. W. Hoffman Wood, 14, Park-square, Leeds:—

E. Fox	£4,248 0 0	W. Moss	£3,433 0 0
Varlow	4,000 0 0	E. Clarke	3,295 0 0
T. Lowe & Son	3,890 0 0	George Hodges	3,290 0 0
W. Edwards	3,605 0 0	Gee Brothers	3,256 0 0
Walker & Slater	3,565 0 0	J. & T. W. Selby	3,238 0 0
Brooks	3,496 2 6		

CHAPELTOWN (Yorks).—For the construction of a 9-inch pipe sewer, manholes, &c., Houseley Park, For the Wortley Union Rural Sanitary Authority. Mr. G. E. Beaumont, surveyor, Grenoside, Sheffield:—

John Hill	£160 0 0	George Hall, 18, Broadfield Park-road, Sheffield*	£104 18 6
Jas. Trippett	140 0 0		
J. H. Naylor	120 0 0	*Accepted.	

CRICKLEWOOD.—For new roads and sewers on the Cotton Estate at Cricklewood, N.W. Messrs. Philip D. Tuckett & Co., surveyors:—

Eli Wilson	£1,400	C. Killingback & Co.	£1,310
John Mowlem & Co.	1,325	Richd. Ballard	1,297
W. H. Watts	1,324	E. Rogers & Co.	1,237
Nowell & Robson	1,320		

CROYDON.—For new premises in the rear of Nos. 6, 8, 10, and 12, North-end, for Mr. J. Allder. Mr. Alfred Broad, architect, 27, Dingwall-road, Croydon. Quantities supplied by the architect:—

Bowyer & Son	£2,390	E. P. Bulled & Co.	2,080
D. W. Barker	2,327	M. Taylor	2,062
W. Marriage	2,280	E. J. Saunders	2,021
Batley & Linfoot	2,195	G. E. Bryan & Son, Norwood*	2,008
J. Smith & Sons	2,173		
A. Bullock	2,149	*Accepted.	

EAST HAM.—For providing and laying concrete pavement *in situ* (10,000 yards super) and maintaining for fifteen years, for the Local Board. Mr. Savage, Surveyor, Local Board Offices, East Ham:—

	Per yard super.
The Patent Grano Metallic Paving Co.	5 2
W. B. Wilkinson & Co.	4 7
Metallic Paving and Artificial Stone Co.	4 7
The Imperial Stone Co., Ltd.	3 11
Jones' Annealed Concrete Co., Ltd.	3 8
Stuart's Granolithic Paving Co., Ltd., Limehouse, E.*	3 7½
Patent Paving and Construction Co., Ltd., 9, Victoria-street, Westminster, S.W.*	3 6½

* Contract divided between the two marked thus.

HARROW.—For the erection of school buildings, Pinner-road, Sudbury, for the School Board. Messrs. Houston & Houston, architects, 13, Furnival's-inn, London, E.C. Quantities by Mr. Alan Paull, F.S.I., 6, Quality-court, W.C.:—

J. Chessum & Sons	£2,553	F. G. Minter	£2,297
S. Grist	2,438	Gullett Bros.	2,291
J. Smith & Sons	2,415	T. Tilbury	2,280
H. Haynes	2,395	C. Jackson	2,279
R. Ballard	2,337	F. Larter, Harrow Weald*	2,260
H. M. Dove & Co.	2,330	*Accepted.	

HANLEY (Staffs).—For alterations and additions to relief and other offices, Charles-street, for the Union Guardians. Mr. E. E. Scrivener, architect, Hanley:—

C. Cornes	£175 0	J. T. Clarke	£153 0
Ogden & Banks	175 0	T. Godwin	148 0
Steadman & Sylvester	166 15	G. Ellis (accepted)	140 0
		[All of Hanley.]	

HASTINGS.—For the construction of roads and sewers (2,000 lineal feet), including kerbing, &c., Barley-lane Estate, for Mr. H. H. Hewlings. Messrs. F. & J. Plowman, architects, 35, Havelock-road, Hastings. Quantities by the architects:—

Coker	£3,250 0 0	Catley	£2,450 0 0
Neave & Son	2,980 0 0	Piper & Son	2,387 16 4
Trueman	2,960 0 0	Wheeler	2,379 0 0
Cattell	2,726 0 0	Marchant, Ore*	1,925 0 0
		* Accepted.	

HESSLE (Yorks).—For the erection of a police-station for the Standing Joint Committee of the East Riding. Mr. A. Beaumont, County Surveyor, County Hall, Beverley. Quantities supplied:—

B. Nicholson	£1,663 5 0	G. & R. Pape	£1,420 0 0
Geo. Jackson & Son	1,620 0 0	Jackson Bros.	1,415 0 0
F. Blackburn & Son	1,537 18 0	A. Moore	1,385 0 0
G. F. Tasker	1,475 8 10	F. W. Thompson	1,346 2 0
Colley & Levett	1,473 0 0	E. Prost, Hessle*	1,325 11 0
R. Potts	1,466 5 0		

* Reduced on amendment of plans and accepted at £1,224 1 3

KILKEEL (Co. Down).—Accepted for the erection of a new rectory at Kilkeel. Mr. Max Clarke, architect:—

Neill Bros., Newcastle £1,115 0 0

KINTBURY.—For erecting residence at Kintbury, near Hungerford. Mr. A. E. Sidford, architect, Wokingham:—

W. J. May, Bracknell (lowest of three) £585 0 0
[Accepted with additions at £624 10 0.]

LEEDS.—Accepted for the erection of a lecture hall, Eldon Wesleyan Church. Mr. Geo. F. Danby, architect, 46, Great George-street, Leeds:—

Bricklayer and Mason.—Charles Myers	£239 0 0
Carpenter and Joiner.—Thomas Harrod	196 0 0
Plumber and Glazier.—J. E. Bedford	73 5 0
Slater.—J. Atkinson & Son	56 0 0
Plasterer.—J. W. Watson	12 0 0
Warming Apparatus.—C. Holmes & Co.	24 10 0
Painter.—A. Welham	17 0 0
Total	£608 15 0

[All of Leeds.]

LEEDS.—Accepted for the erection of Trinity Wesleyan chapel and vestries, Roundhay-road. Mr. G. F. Danby, architect, 46, Great George-street, Leeds:—

Bricklayer and Mason.—Thos. Hannam	£2,360 0 0
Carpenter and Joiner.—Joseph James	1,250 0 0
Plumber and Glazier.—G. Lazenby & Co.	308 0 0
Slaters.—J. Atkinson & Son	72 0 0
Plasterer.—Thos. Moore	220 0 0
Painter.—A. Bateman	59 0 0
Ironfounder and Warming.—J. & H. Smith	202 0 0
Total	£4,471 0 0

[All of Leeds.]
[Architect's estimate, £4,500.]

LONDON.—For building new factory, and alterations to premises, Victoria Dock-road, E., for Messrs. Wiggins & Rihll. Messrs. Adams & Mann, architects, 65, Leadenhall-street, E.C.:—

Sparks	£2,450	A. Drew	£1,933
Appleton	2,420	Woods	1,790
Osborn	2,260	Johnson	1,687
Madderson	2,030		

LONDON.—For additions to factory, Spa-road, Bermondsey, for Messrs. B. Noakes & Co. Mr. Lawton R. Ford, architect, St. Thomas' Chambers, London Bridge, S.E.:

W. F. Russell	£399	A. White & Co.	£385
A. B. Chirgwin	393	Wm. Preston (accepted)	370

LONDON, S.W.—For the erection of six shops, repairs, &c., High-street, Clapham, for Mr. T. G. Foster. Messrs. Lawson & Donkin, architects, Yelverton-chambers, Bournemouth. Quantities by the architects:—

Norris & Luke	£2,864 0 0	W. H. C. Curtis	£2,429 0 0
Battley, Son & Holness	2,644 0 0	Garrett & Son	2,427 0 0
Reed, Blight & Co.	2,559 10 0	E. Trigg	2,400 0 0
Stewart & Co.	2,537 8 10	J. H. Jarvis	2,353 0 0
De Vere, Buckingham & Co.	2,498 0 0	T. H. Kingerlee, Oxford*	2,345 0 0
		* Accepted.	

LONG BUCKBY.—For the erection of school buildings for the School Board. Mr. C. Dorman, architect, 51, Abington-street, Northampton:—

J. T. Wingrove	£1,122	J. Woodford & Son	£1,020
C. Haynes	1,109	C. Luck, Long Buckley*	1,010
W. Chester	1,100	Sturgess & Son	1,069
J. A. Johnson	1,074	*Accepted.	

NEW SOUTHGATE.—For the erection of a terrace of six houses and one shop in Cromwell-road, New Southgate, N., for Mr. A. Hales. Plans and specification prepared by Mr. W. D. Bullis, surveyor, 21, Finsbury-pavement, E.C.:—

Smith	£2,187	J. Hall	£1,750
Seabrook	2,155	Simpson	1,680

NORTHAMPTON.—For the erection of shoe factory, Oliver-street, Kingsley Park, for Messrs. Singlehurst & Gulliver. Mr. C. Dorman, architect, 51, Abington-street, Northampton:—

J. T. Wingrove	£2,658	W. Walls	£2,573
Green Bros.	2,645	H. Martin	2,516
A. P Hawten	2,615	R. Hickman	2,514
Woodford & Son	2,600	W. Heap (accepted)	2,476
D. Sharman	2,595	[All of Northampton.]	

POOLE.—For the construction of a quay-wall and dredging in connexion therewith, for the Harbour Trustees. Messrs. Kinipple & Jaffrey, engineers, 3, Victoria-street, Westminster, London, S.W.:—

Frank Bevis	£14,486 0 0	J. Cochrane & Sons,	
H. J. Sanders	13,100 0 0	5, Victoria-street,	
J. H. Lawton & Co.	10,726 15 4	S.W.*	£10,060 0 0
John Band	10,630 13 0	* Accepted.	

POOLE.—For the erection of offices for Mr. J. J. Norton. Messrs. Lawson & Donkin, architects, Yelverton-chambers, Bournemouth. Quantities by architects:—

F. Hoare & Sons	£2,247	E. Bath & Co.	£2,057
G. Bevan	2,115	George & Harding	2,025
Judd & Foot	2,100	Crane	1,968
J. W. Lucas	2,100	Rigler	1,950
Entwisle & Cox	2,090	J. Eaton, Poole*	1,742
	*Accepted.		

READING.—For alterations and additions to the Borough Police Station, for the Corporation. Mr. Arthur E. Collins, Borough Engineer, Town Hall, Reading:—

F. Newberry	£276 0 0	G. H. Tucker	£258 0 0
T. Pilgrim	273 0 0	W. Hawkins	237 12 8
R. Webber	272 10 0	G. Searle*	227 17 0
A. Simonds	269 0 0	G. Simonds	219 0 0
	[All of Reading.]		
	* Recommended for acceptance.		

RUSHDEN (Northants).—For metalling, channelling, and paving various streets on the Rock estate, for the Local Board. Mr. W. Pare, Surveyor, High-street, Rushden:—

Robt. Marriott	£2,080 0	W. T. Hall	£1,850 0
J. C. Trueman	1,887 4	F. Barlow, Rothwell,	
W. Wilmott	1,860 0	Kettering (accepted)	1,500 0

SOUTHEND-ON-SEA. — For the erection of a detached residence on the West Cliff Parade, Southend-on-Sea, in accordance with plans and specification prepared by Mr. W. D. Bullis, surveyor, 21, Finsbury Pavement, E.C.:—

Lawrence & Son	£1,325	Darke & Son	£999
F. Dupont	1,287	F. England	875

STACKSTEADS (Lancs.).—Accepted for the extension of club premises, New Church-road, for the Trustees and Committee of Stacksteads Workmen's Club. Mr. Jas. Wilson, Borough Surveyor:—

Jas. Hargreaves, Bacup £600 0 0

STOKE-ON-TRENT.—For the erection of the Heron Cross Schools, Fenton, for the Stoke-on-Trent School Board. Messrs. R. Scrivener & Sons, architects, Hanley, Staffs:—

Minks	£6,824 0 0	Yoxall	£5,855 0 0
Ellis	6,470 0 0	Tomkinson & Betteley	5,797 0 0
Cook	6,384 10 0	Inskip, Longton*	5,749 0 0
Godwin	6,147 0 0	Goodwin	5,709 0 0
Embrey	5,960 0 0	* Accepted.	

WEST HAM.—For cleaning the inside and painting the outside of the Hospital and Dispensary at West Ham, for the Committee of Management:—

North	£345 0 0	Seed	£186 0 0
Newman	257 15 0	Fowler Bros.	175 0 0
Read	240 17 10	Buckeridge Bros.	159 0 0
Hands	195 10 0	Co-operative Painters*	152 9 0
Holland	189 0 0	* Accepted.	

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R.M.D.L.—R. W. (the matter is a medical one, and out of our province).—H. F. H. (received).—W. G. S. (amounts should be sent).—B. and H. (ditto).—F. E. (ditto).—S. W. (ditto).—W. J. J. (ditto).—C. E. B. (we cannot find space for tenders for horse-hire).—H. P. (too late).—A. E. G. (ditto).—R. W. (ditto).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

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SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before 10 a.m. on WEDNESDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c., left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

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READING CASES, { NINEPENCE EACH. / By Post (carefully packed), 1s.

ESTABLISHED 1866.

J. J. ETRIDGE, Jr.

SLATE MERCHANT,

SLATER and TILER.

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To be Executed by Contract in any part of ENGLAND.

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And other description of Slates ready for immediate delivery to any Railway Station.

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BETHNAL GREEN, LONDON, E.

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ENGLAND AND WALES.

1891.

*1. Canterbury	*Jan.* 3	*5. Wells	*May* 2	9. Norwich	*Sept.* 5
*2. Lichfield	*Feb.* 7	6. Exeter	*June* 6	10. Rochester	*Oct.* 3
*3. St. Alban's	*Mar.* 7	7. Salisbury	*July* 4	11. Lincoln	*Nov.* 7
*4. Peterboro'	*April* 4	8. Bristol	*Aug.* 1	12. Gloucester	*Dec.* 5

1892.

13. St. Paul's	*Jan.* 2	17. Llandaff	*May* 7	21. Bangor	*Sept.* 3
14. Hereford	*Feb.* 6	18. Oxford	*June* 4	22. St. Asaph	
15. Chichester	*Mar.* 5	19. Southwell	*July* 2	23. Winchester	*Oct.* 1
16. Ely	*April* 2	20. Worcester	*Aug.* 6	24. Truro	*Nov.* 5
		25. St. David's	*Dec.* 3		

1893.

*26. York	*Jan.* 7	28. Chester	*Mar.* 4	30. Carlisle	*May* 6
27. Ripon	*Feb.* 4	29. Manchester	*April* 1	31. Durham	*June* 3

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SCOTLAND.

1893.

1. Glasgow	*July* 1	3. Aberdeen	*Sept.* 2	5. Iona	*Nov.* 4
2. Edinburgh	*Aug.* 5	4. Kirkwall	*Oct.* 7	6. Dunblane	*Dec.* 2

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HAM HILL STONE,

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Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

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METCHIM & SON, 20, Parliament-st., S.W. "QUANTITY SURVEYORS' TABLES AND DIARY," For 1893, price 6d. post 7d. In leather 1/- Post 1/1. [ADVT.

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F. BRABY & CO.

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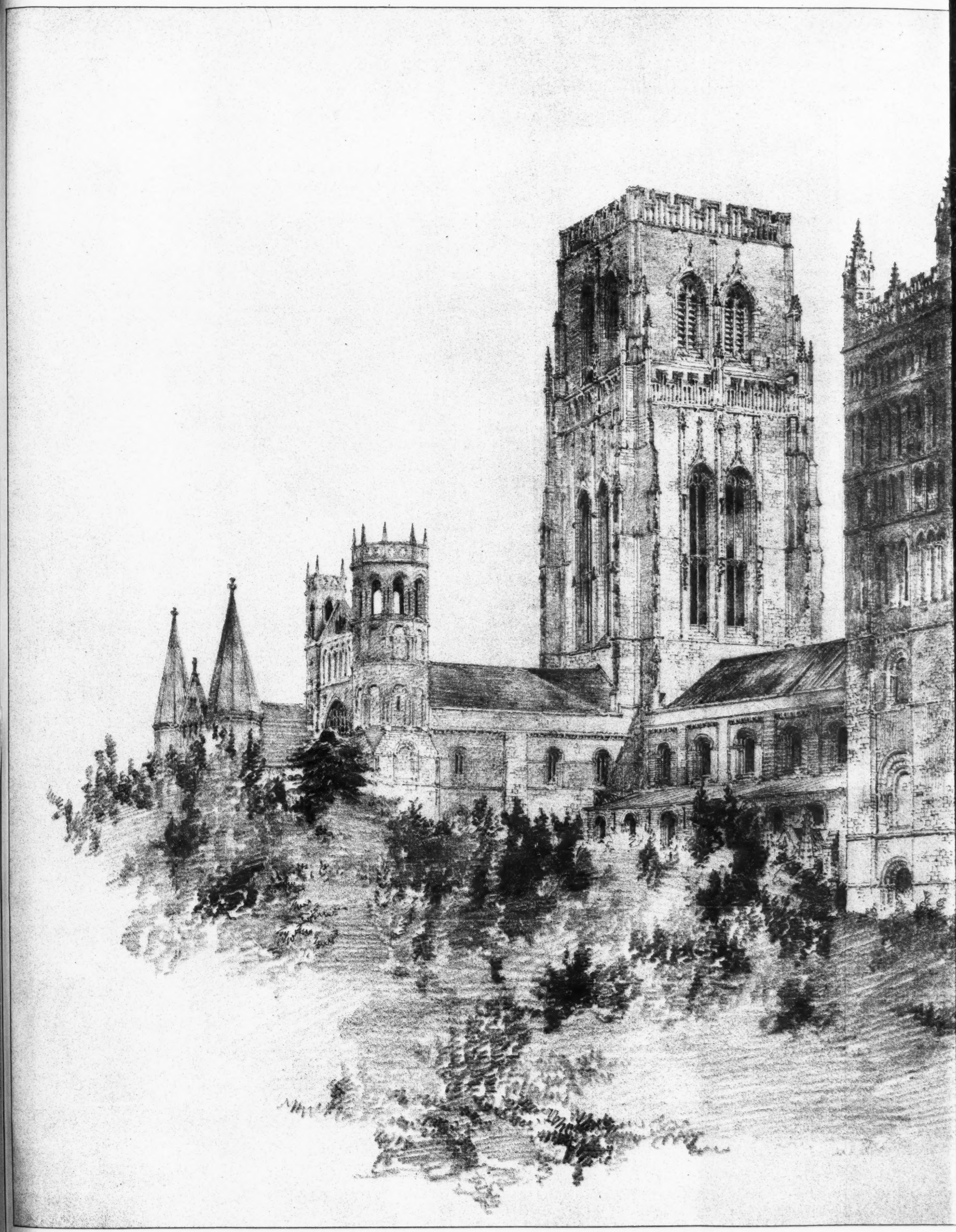
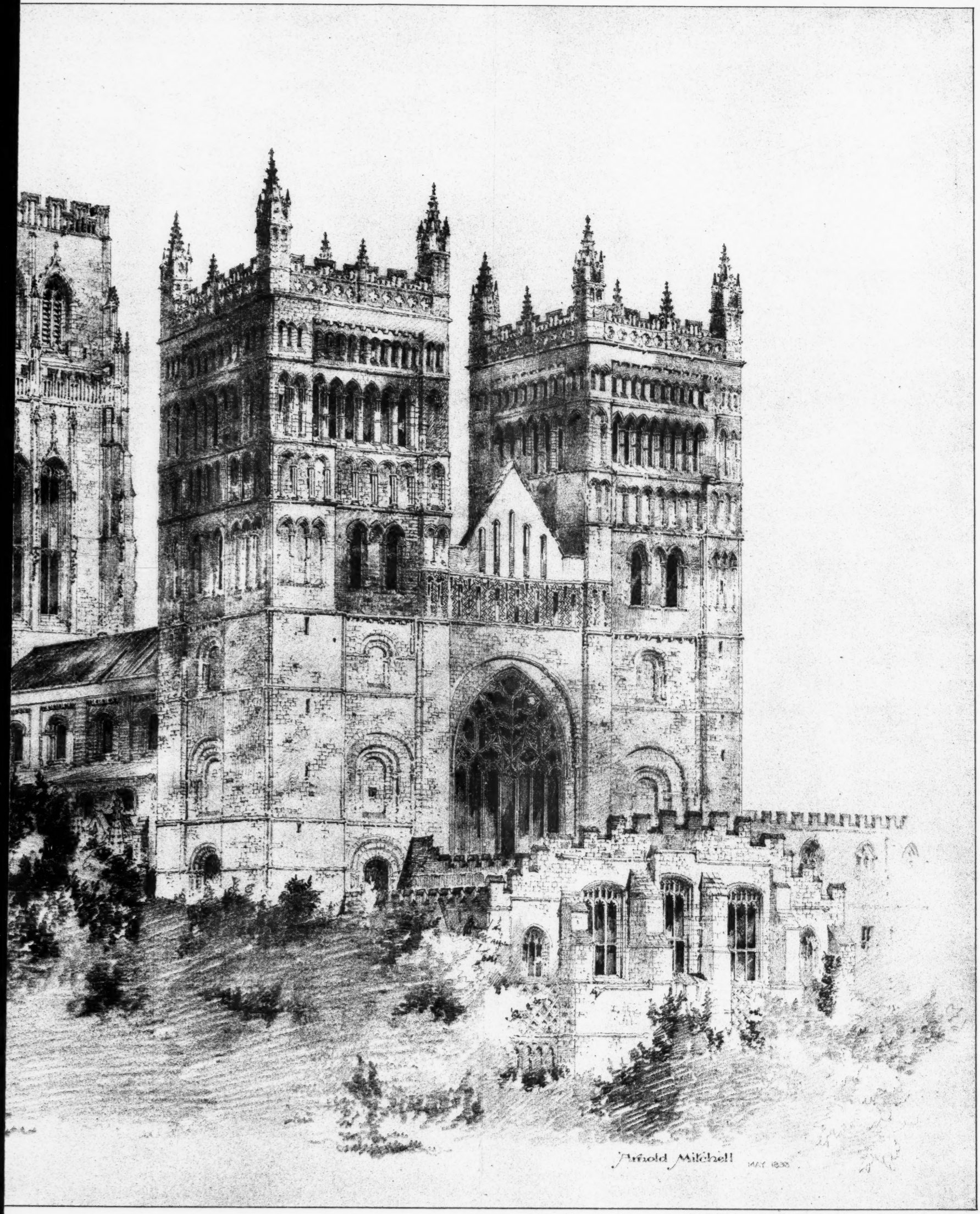
6 and 8, HATTON GARDEN.

GLASGOW:
47 and 49, ST. ENOCH-SQUARE.



Cathedrals of England and

No. 31. DURHAM: FROM THE NORTH-WEST.—Drawn by Mr



INA PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET FETTER LANE E.C.

thedrals of England and Wales.

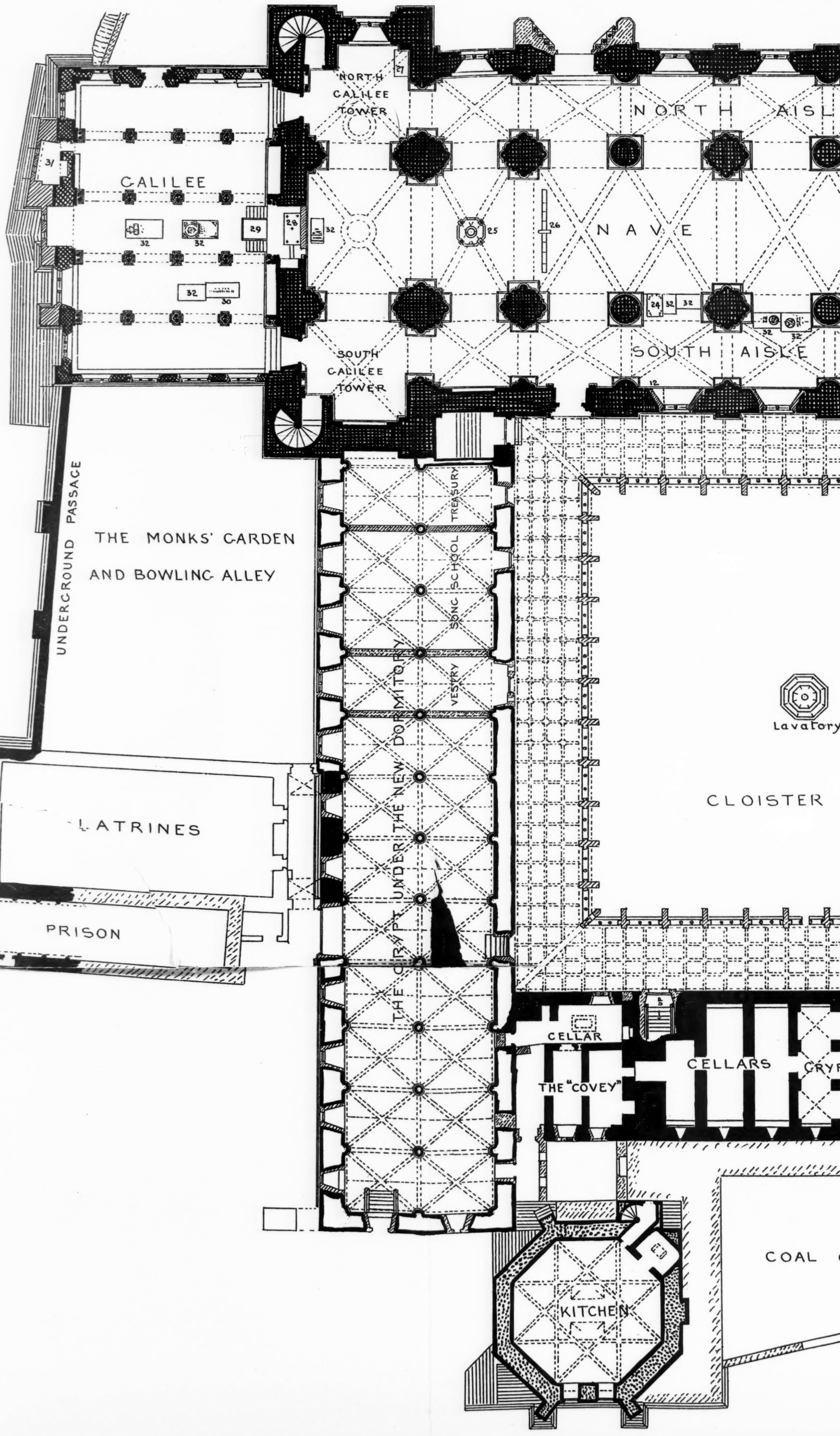
OM THE NORTH-WEST.—Drawn by Mr. Arnold Mitchell, A.R.I.B.A.

DURHAM CATHEDRAL AND MONASTERY

GROUND PLAN

SCALE

10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 FEET



NORTH TRANSEPT

NORTH AISLE

LANTERN

CHOIR

SOUTH AISLE

SOUTH TRANSEPT

REVESTRY destroyed 1802.

SLYPE OR PARLOUR

CHAPTER HOUSE

<— This part destroyed 1796

PRISON

Cell Cell

CRYPT

PRIORY

VAULT UNDER PRIORS CHAPEL

CRYPT UNDER FRATER Ho.

KEY TO THE SHADING

NORMAN 1st PERIOD
Bishops Walcher & Carile and the Monks.

NORMAN 2nd PERIOD
Bishop Flambard

TRANSITIONAL.

EARLY ENGLISH.

DECORATED.

PERPENDICULAR.

MODERN.

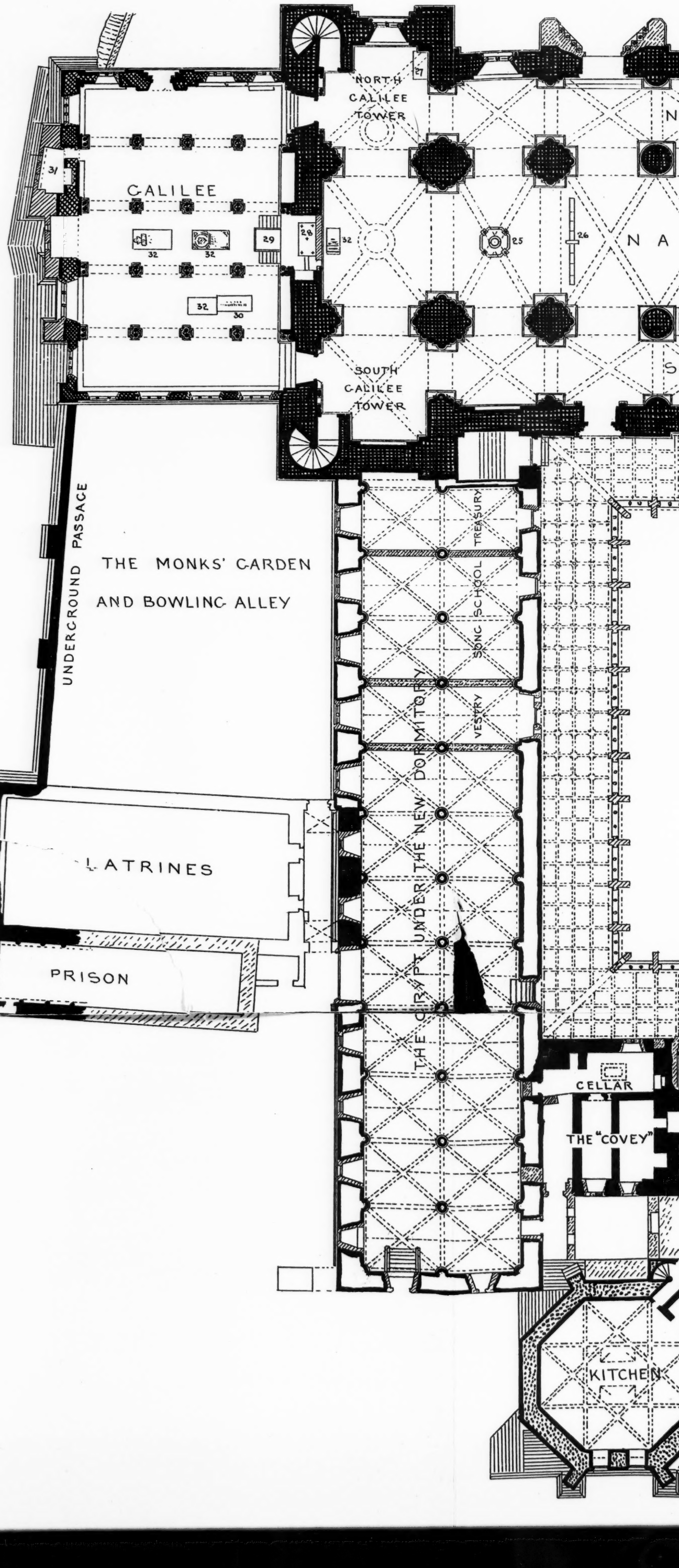
BUILDINGS DESTROYED

DURHAM CATHEDRAL AND MO

GROUND PLAN

SCALE

10 5 0 10 20 30 40 50 60 70 80 90 100 110 120



ONASTERY

120 130 140 150 FEET

NORTH AISLE

NORTH TRANSEPT

NORTH

CHOIR

LANTERN

AVE

SOUTH AISLE

SOUTH TRANSEPT

SOUTH

REVESTR

SLYPE OR PARLOUR

Lavatory

CLOISTER GARTH

CHAPTER HOUSE

(This part destroyed 1796)

PRISON

Cell Cell

CELLARS

CRYPT UNDER FRATER H.

CRYPT

PRIORY

VAULT UNDER

COAL CARTH

AND MONASTERY

PLAN

E
90 100 110 120 130 140 150 FEET

NORTH AISLE

NAVE

SOUTH AISLE

NORTH TRANSEPT

LANTERN

SOUTH TRANSEPT

SLYPE OR PARLOUR

Lavatory

CLOISTER GARTH

CHAPTER HOUSE
This part destroyed 1796

PRISON

Cell Cell

CELLAR

CELLARS

CRYPT UNDER FRATER H.

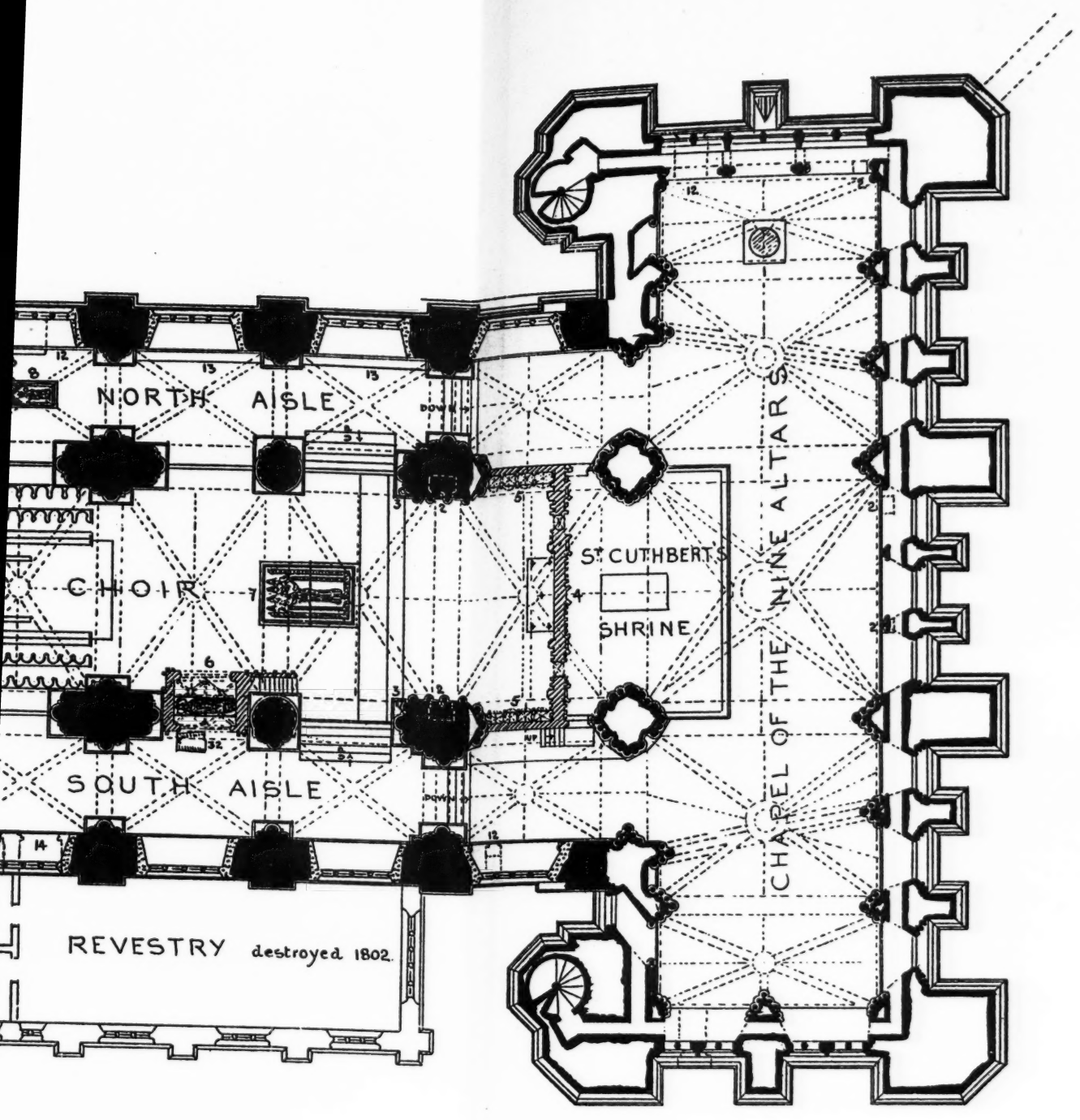
THE "COVEY"

CRYPT

PRIORY

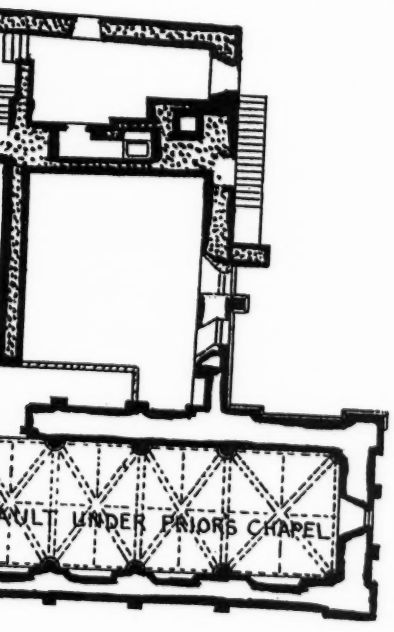
COAL GARTH

KITCHEN



KEY TO THE SHADING

- NORMAN 1st PERIOD, Bishops Walcher & Carileph, and the Monks.
- NORMAN 2nd PERIOD, Bishop Flambard
- TRANSITIONAL.
- EARLY ENGLISH.
- DECORATED.
- PERPENDICULAR.
- MODERN.
- BUILDINGS DESTROYED.



REFERENCES

1 Tomb of Bp Van Mildert
2 Aumbries and lockers
3 Image brackets
4 Nevill Screen
5 Sedilia
6 Bp. Hatfields tomb and throne.
7 Matrix of Bp. Beaumont's brass.
8 do. Bp. Skirlaugh's do.
9 Base of a tomb (?)
10 Monument of Rev. John Carr.
11 do. of Matthᵛ Woodlfield
12 Doorways blocked.
13 Stone benches.
14 Door to Revestry
15 do. to lofts over Revestry
16 Pillars of a "Norman" altar
17 "Norman" piscina
18 Clock case destroyed.
19 Oven for baking altar breads
20 Tomb of Lord Ralph Nevill.
21 do. of Lord John Nevill
22 do. of Bp. Nevill
23 do. of Rev. James Britton
24 Base-stone of Bede's Feretory
25 Font.
26 The Women's boundary cross
27 Monument to Captⁿ Hunter
28 Altar to the Blessed Virgin Mary
29 Tomb of Cardinal Langley
30 do. of the Venˡᵉ Bede.
31 Vestry.
32 Various grave slabs.
33 Triangular headed window
34 Monument of Bp. Barrington
35 Position of holy water stone.
36 Walls of 14th century date (destroyed).

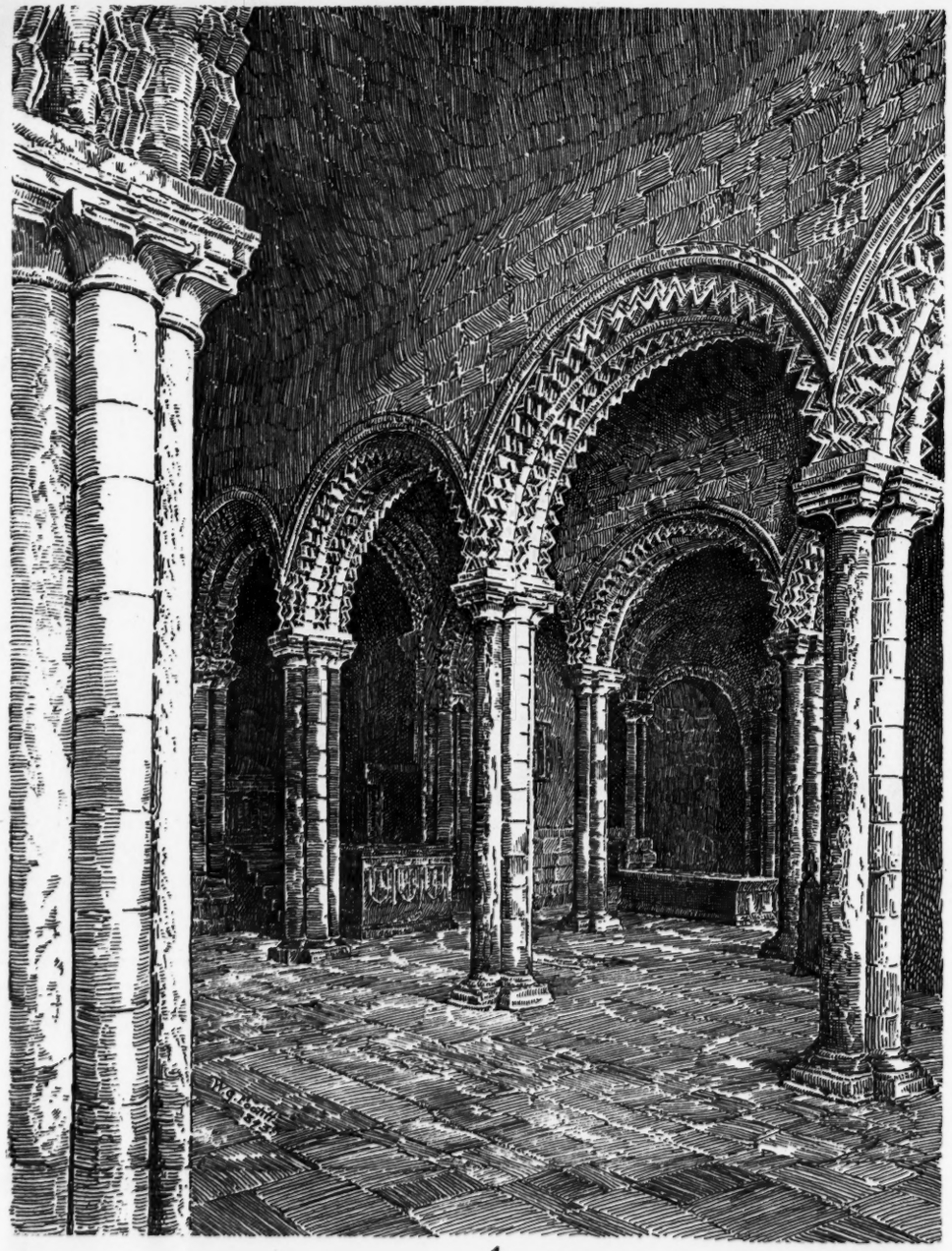
Charles Clement Hodges. delt.
May 1893.

PHOTO-LITHO. SPRAGUE & Co 4 & 5 EAST HARDING STREET FETTER LANE E.C.

DURHAM CATHEDRAL.

VARIOUS INTERIOR VIEWS, FROM DRAWINGS SUPPLIED BY MR. C. C. HODGES.

1. THE GALILEE, FROM THE NORTH-WEST ANGLE.
2. THE NINE ALTARS, FROM THE TRIFORIUM OF THE CHOIR.
3. EAST SIDE OF SOUTH TRANSEPT, FROM THE TRIFORIUM OF THE NAVE.



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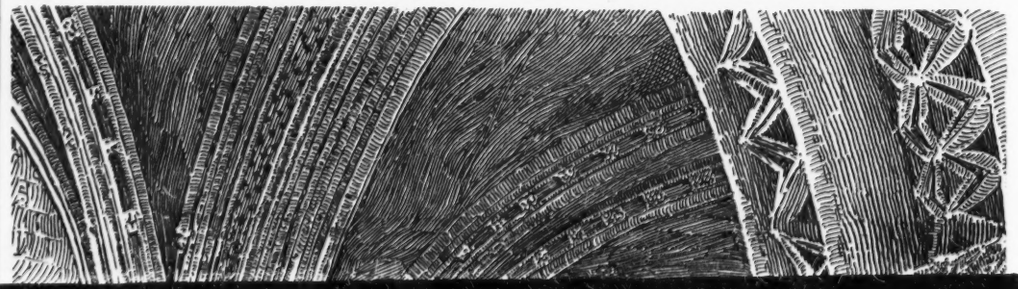

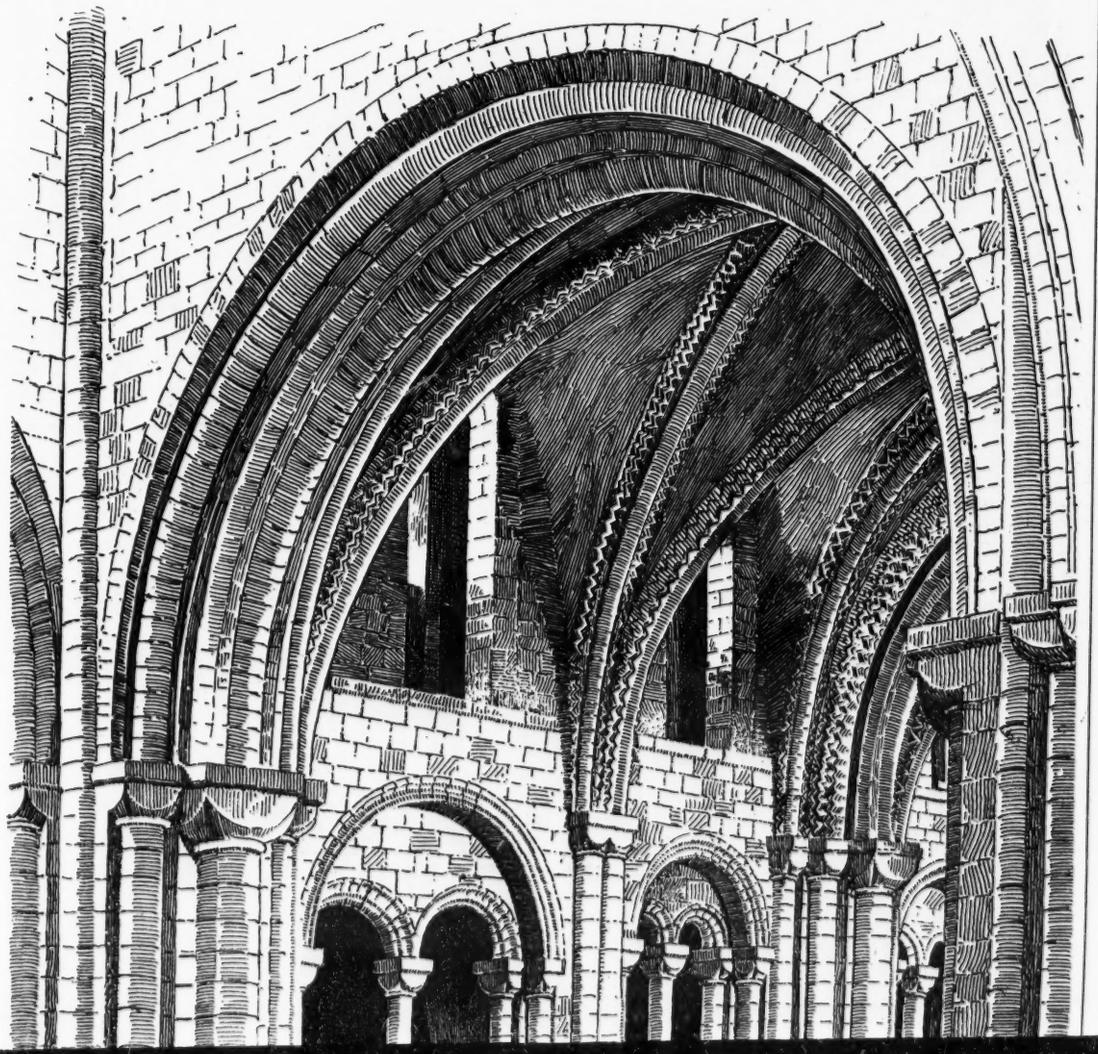

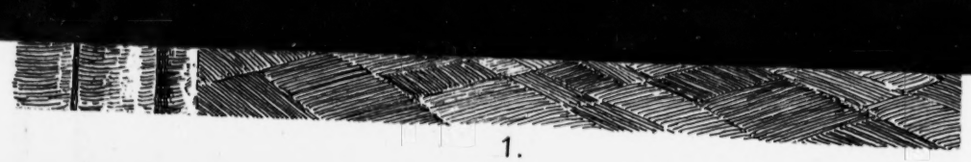

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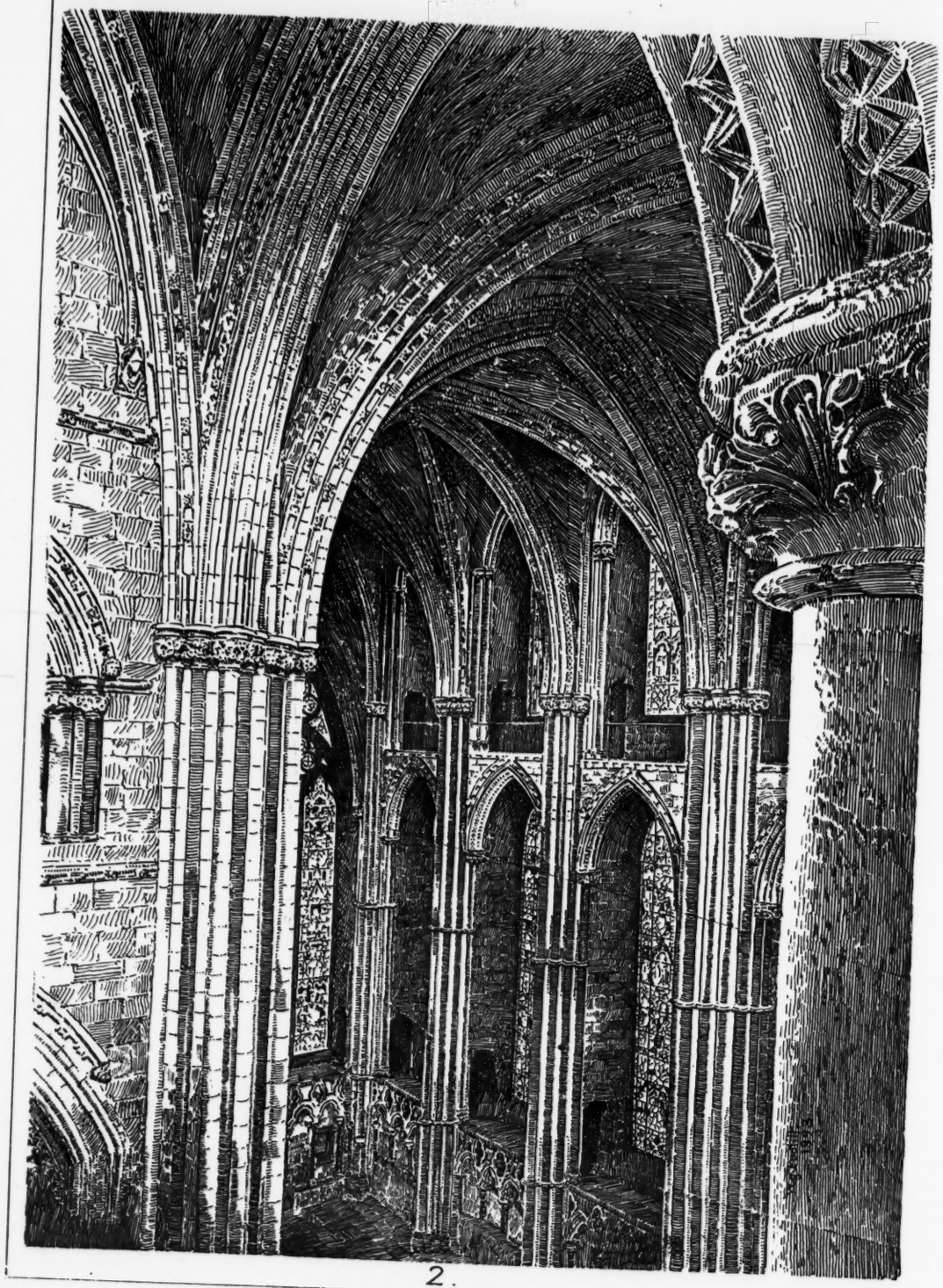

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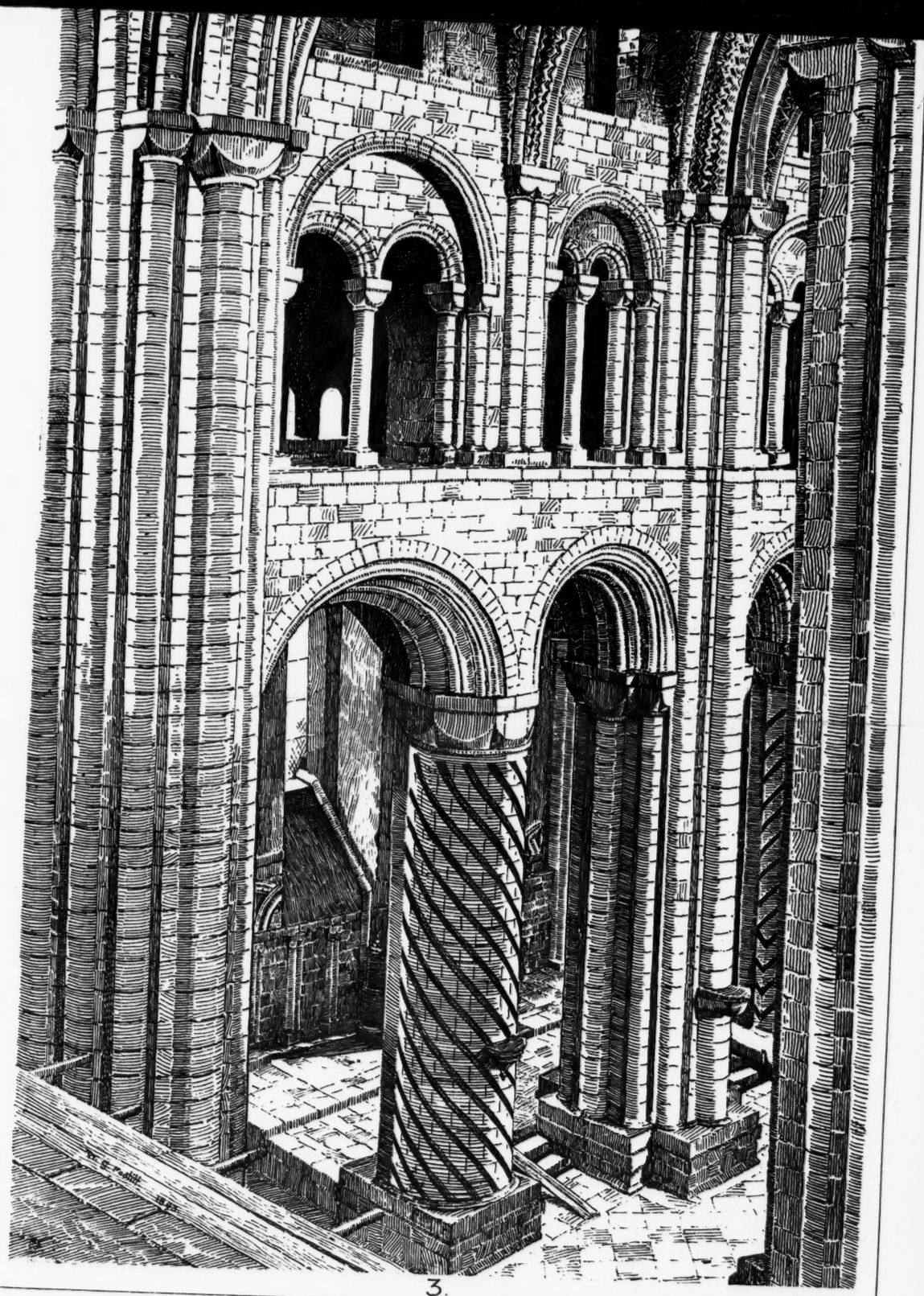

3.

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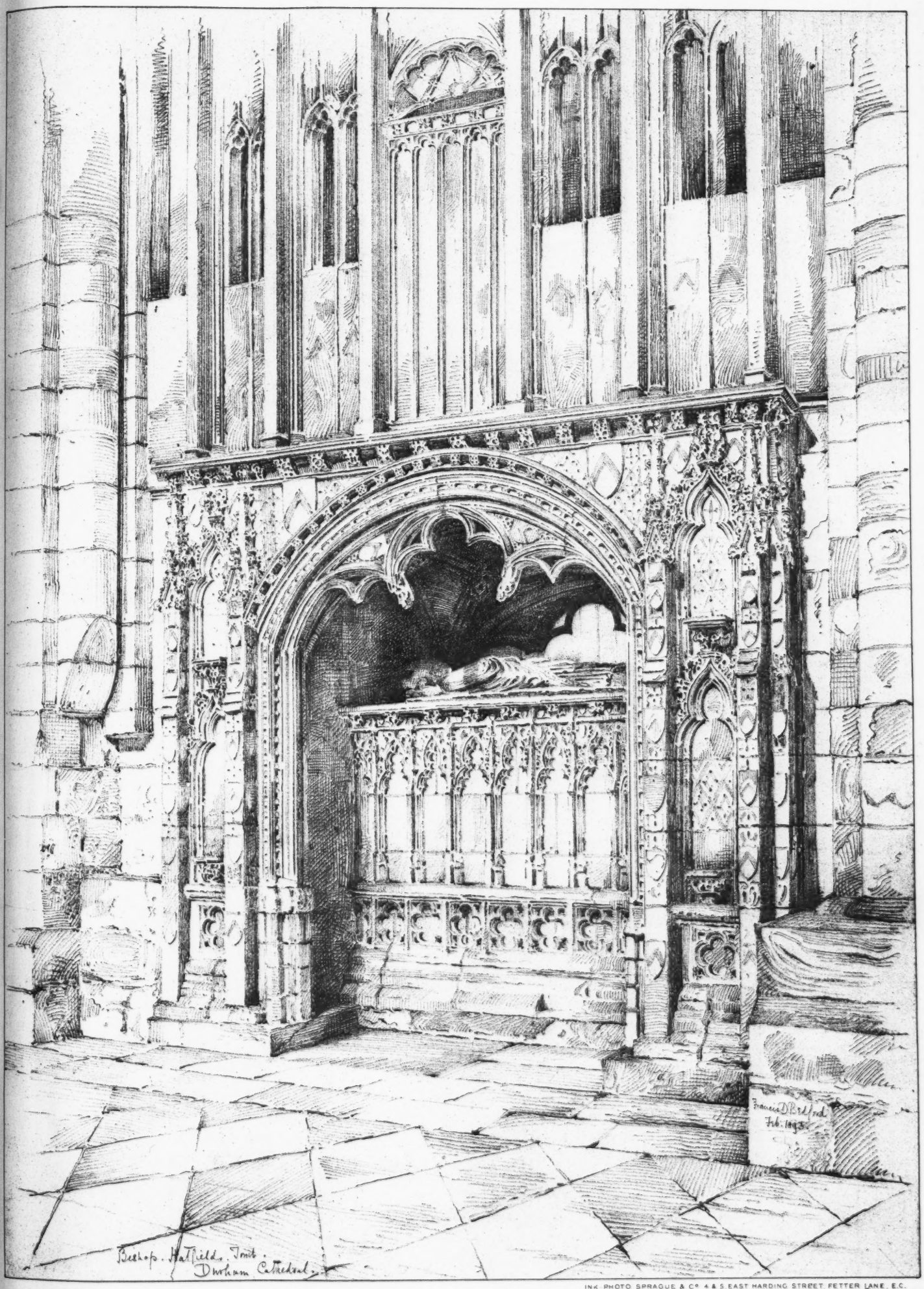
INK PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET, FETTER LANE E.C.

DURHAM CATHEDRAL: VIEW IN SOUTH AISLE OF NAVE, LOOKING NORTH-WEST.—Drawn by Mr. H. W. Brewer.



INK. PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

DURHAM CATHEDRAL: BISHOP HATFIELD'S TOMB.—Drawn by Mr. F. D. Bedford, A.R.I.B.A.